[No. 5]

NAVAL PETROLEUM RESERVES

HEARINGS

BEFORE THE

COMMITTEE ON ARMED SERVICES
HOUSE OF REPRESENTATIVES

EIGHTY-THIRD CONGRESS

FIRST SESSION

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[No. 5]

NAVAL PETROLEUM RESERVES

WEDNESDAY, FEBRUARY 25, 1953

HOUSE OF REPRESENTATIVES,
COMMITTEE ON ARMED SERVICES,
Washington, D. C.

(The committee met at 10 a. m., the Honorable Dewey Short (chairman of the committee) presiding.

The CHAIRMAN. The committee will please be in order.

It will be necessary for us to recess promptly at a quarter to 12 today in order to go to the floor to call up the so-called Davis amendment under suspension of the rules. We hope to pass it without too much difficulty in the 40 minutes that are allowed.

We meet this morning to consider the Elk Hills Naval Petroleum Reserve No. 1 project. There is no man I know who is so thoroughly familiar with this Elk Hills project as the former chairman of this committee, Mr. Vinson, who lived with it day and night.

I might say the gentleman from New York, Mr. Cole, is also thoroughly familiar with it. All the older members of the committee are more or less familiar, but in order to bring us up to date and refresh our memories, and particularly for the benefit of the new members of this committee, I have gone over this whole question of naval petroleum reserves at considerable length with chief counsel of our committee, Mr. Smart.

I told him a few days ago it would be most helpful, I thought for all of us concerned—not only members of the committee but representatives of the Standard Oil Co., as well as representatives of the Navy Department of the Government who are here this morning, if he would take just a few minutes to give us a brief but rather comprehensive picture and history of this whole problem. He has done that. He has prepared a four-page statement. It isn't long. I hope that the members of the committee will pay close attention to this statement which I consider gives you a very accurate picture of the whole problem. If the chief counsel will proceed, we will hear Mr. Smart at this time.

Mr. SMART. Mr. Chairman, for the purpose of the record, I would like to state that the meeting today and tomorrow will be devoted to the general subject of naval petroleum reserves.

There are four such reserves: Naval Petroleum Reserve No. 1, Elk Hills, Calif.; Naval Petroleum Reserve No. 2, Buena Vista, Calif.; Naval Petroleum Reserve No. 3, Teapot Dome, Wyo.; and Naval Petroleum Reserve No. 4, Point Barrow, Alaska.

In addition to these 4 petroleum reserves, there are 3 oil-shale reserves, 2 in Colorado and 1 in Utah.

Today's hearing will be devoted to Naval Petroleum Reserve No. 1 at Elk Hills, Calif.

By Executive order dated September 2, 1912, President Taft created Naval Petroleum Reserve No. 1, an area of approximately 38,000 acres in Kern County, Calif. Of the area lying within the boundaries of the petroleum reserve, approximately 12,000 acres appear to be legally patented to private owners and the remaining 26,000 acres remain in the ownership of the Government.

The reserve consists of three producing zones. The first is known as the shallow zone. It is estimated to have originally contained approximately 550 million barrels of oil. Since the earliest days of this oil reserve, there has been production from this shallow zone. Beginning in 1944, when the Elk Hills Field came under the unit plan contract between the Navy and the Standard Oil Co. of California, a more orderly process of field management was instituted, in keeping with the theory of a naval petroleum reserve. However, it is estimated that approximately 210 million barrels of the original 550 million barrel potential has now been produced.

Therefore, it is estimated that there remains in this shallow zone approximately 350 million barrels of oil.

The next productive zone is known as the Stevens zone. It is somewhat deeper than the shallow zone and at present is estimated to have a potential production of 350 million barrels. This particular zone has been rather well defined through drilling operations but its productive potential has not been appreciably disturbed through drilling operations as has been the case of the shallow zone.

The third productive zone at Elk Hills is known as the Carneros zone and it is a relatively recent discovery at a depth of approximately 9,000 feet.

Sufficient drilling has not yet occurred in order to make a fully accurate estimate of the oil potential. On the basis of drilling explorations to date, the potential is roughly estimated at 50 million barrels. The small amount of oil which has been produced as a result of drilling exploration to date from this zone is of extremely high quality and that which has been sold has brought premium prices.

Practically all of the difficulties which have been experienced at Elk Hills have been in connection with the shallow zone. As I have previously stated, there was considerable drilling and production throughout the productive area for many years. In 1944, pursuant to Public Law 343, 78th Congress, 2d session (June 17, 1944), the Navy and the Standard Oil Co. of California entered into a unit plan contract. During 1944 and 1945, the field was opened to emergency production pursuant to a joint resolution of Congress authorizing such production, and for a period following that time certain amounts of production were authorized during the so-called primary period. Both the law and the contract have allowed Standard to receive oil from the shallow oil zone to compensate them in part for entering into the unit plan contract.

That primary period ended on August 2, 1950. During the secondary period, now in effect, the Navy gets eight-ninth's of the oil and Standard gets one-ninth of the oil.

In August 1945, by order of the Secretary of the Navy, the daily production was decreased from 65,000 barrels to 15,000 barrels, which incidentally was a wartime emergency production, and was further reduced to 8,450 barrels daily in May of 1946, this amount of production being deemed necessary to keep the field in a state of readiness. The production has subsequently been reduced to 6,200 barrels of oil per day from the shallow oil zone. The Secretary of the Navy is required by the provisions of existing law to maintain the field in a state of readiness and is also required to maintain the field in such condition as to insure the ultimate maximum recovery of oil. For the purpose of keeping abreast of all of the technical developments in the field, the Navy and Standard established an engineering committee with equal representation, pursuant to the provisions of the unit plan contract of 1944.

On August 15, 1952, the Under Secretary of the Navy, the Honorable Francis P. Whitehair, directed a letter to Mr. Vinson, then chairman of this committee, outlining certain circumstances in connection with the shallow oil zone which were deemed to be damaging to this particular zone. His engineering staff and the representatives of Standard on the Engineering Committee had unanimously agreed that damage was being inflicted and they unanimously recommended a course of action to curtail or prevent this damage. The suggested remedy involved the drilling of a number of new wells in the shallow zone. It was then estimated that the drilling of these new wells would result in a net increase of 24,000 barrels per day over and above the present daily production of about 6,200 barrels.

I might add there, I am advised subsequent estimates have run that down to maybe as low as 18,000 barrels net increase rather than 24,000 barrels.

That will subsequently be brought out in testimony.

On September 2, 1952, Mr. Smart, chief counsel of the committee, advised the Under Secretary, Mr. Whitehair, that, in his opinion, Mr. Vinson would oppose the implementation of this plan of protective drilling until the committee had been fully advised of all of the facts.

On September 5, 1952, Mr. Kilday and Mr. Smart held a conference with the Navy and Standard representatives on the Engineering Committee, a verbatim transcript of the conference having been made.

After the chairman reviewed this transcript he was still of the opinion that this proposal for a large increase in the daily production from the shallow zone should be fully reviewed by this committee before further action was taken. The Under Secretary of the Navy fully agreed to this decision of Mr. Vinson and the matter has been held in complete abeyance.

Today we have representatives of the Navy and of the Standard Oil Co. present to present all of the facts in connection with this matter. It is a most important subject involving the public interest and all of the facts will be fully developed.

It was originally planned to have the Secretary of the Navy as the first witness. However, since he has only recently assumed his duties. he has requested that he be excused from testifying until sometime later, perhaps next week. In the meantime, all of the other testimony will be taken.

At the time this matter was submitted to the committee, it appeared to be the opinion of the Navy that no consultation with this committee

was required for the reason that the Secretary of the Navy is required to maintain this field in such condition as to insure ultimate maximum recovery. Since the engineering committee had pointed out to the previous Secretary of the Navy, Mr. Kimball and to his Under Secretary, Mr. Whitehair, that, in their opinion, oil was escaping from one portion of the field and was being contaminated by water in another portion of the field, it seemed to be the Navy's contention that if the Secretary accepted that technical advice, he was authorized and required by law to make a decision without further reference to this committee or the Senate Armed Services Committee. In any event, when objection was raised by Mr. Vinson, the Navy readily agreed to consult with this committee and the record is very clear that the Navy has always leaned over backwards in keeping this committee advised of every development in connection with all of the naval petroleum reserves.

There is nothing under the law or under the unit-plan contract that requires this committee to make any decision with reference to this matter. In my judgment the present meeting constitutes consultation by the Navy with this committee. The ultimate decision is the sole responsibility of the Secretary of the Navy; and, as I have previously stated, he is now reviewing the entire subject matter and will report his decision to the committee at a later date.

There are, Mr. Chairman and members of the committee, witnesses from both Standard and the Navy today. It is now appropriate for the committee to hear from Captain Meade, Director of Naval Petroleum Reserves.

Mr. COLE. What is the respective interest of the parties in the Stevens zone?

Mr. SMART. The Navy owns 80 percent and Standard of California owns 20 percent.

Mr. VINSON. Mr. Chairman.

The CHAIRMAN. Mr. Vinson.

Mr. VINSON. I want to congratulate our chief counsel on the way in which he has set forth in a brief statement the pertinent facts. I do think it is important right now to keep the record straight, to place on file for the record the letter that was addressed to the chairman of the committee in August 1952, stating the reasons why they wanted to increase the production. Then I think it would be in order that the transcript of the testimony taken by Mr. Smart and Mr. Kilday be made a matter of record so it can be printed in the hearings, which were of a very splendid character.

Mr. SMART. Mr. Chairman and Mr. Vinson, I have in my hand that transcript, and included in it are all of the pertinent letters involved in this whole subject, bringing it down to date. With the permission of the chairman, I would at this time insert that transcript because it has not heretofore been printed.

The CHAIRMAN. The committee has not had the advantage of seeing it. I think it should be incorporated in these hearings.

Mr. COLE. Won't the testimony today repeat a good bit of that?

Mr. SMART. It certainly will.

Mr. VINSON. Mr. Chairman, I think it is nothing but proper to put the whole thing in. It is not too long.

The CHAIRMAN. It is not too long.

Mr. VINSON. It will be a complete record.

(The information referred to is as follows:)

NAVAL PETROLEUM RESERVE NO. 1

HOUSE OF REPRESENTATIVES,
COMMITTEE ON ARMED SERVICES,
Washington, D. C., September 5, 1952.

Mr. Paul J. Kilday, from the Committee on Armed Services, met with Mr. R. H. Adams, Mr. A. F. Turman, and Mr. J. H. Thatcher, representing the Standard Oil Co. of California, and Commander M. V. Carson, Jr., Mr. Harry Stolz, and Capt. Robert H. Meade, representing the United States Navy.

Also present: Mr. Matthew Darden, of the Senate Preparedness Committee, and Mr. Robert Smart, staff member, House Armed Services Committee.

Mr. SMART. Gentlemen, the purpose of this conference is to consider the proposal submitted to the committee under date of August 15, 1952, by the Under Secretary of the Navy, the Honorable Francis P. Whitehair, which proposal sets forth certain conditions which have arisen in the naval petroleum reserve No. 1 at Elk Hills, Calif., necessitating, in the opinion of the Navy and representatives of the Standard Oil Co. of California, an increase in the present daily production from that petroleum reserve from approximately 6,200 barrels to something more than 30,000 barrels daily production.

Before we proceed to consider the matters contained in the Under Secretary's letter of August 15, I would like to ask Captain Meade, the Director of Naval Petroleum Reserves, to give a brief narrative history and background of naval petroleum reserve No. 1 which will give a reasonably good picture of the events which have occurred since we acquired this petroleum reserve, and bring us down to date.

Captain Meade, will you proceed in your own way?

STATEMENT OF CAPT. ROBERT H. MEADE, UNITED STATES NAVY

Captain MEADE. President Taft, by an Executive order dated September 2, 1912, created naval petroleum reserve No. 1, constituting an area of approximately 38,000 acres in Elk Hills, Kern County, Calif.

Of the area lying within the boundaries of the reserve, approximately 12,000 acres appear to be legally patented to private owners and the balance, approximately 26,000 acres, remain in the ownership of the Government.

There were a number of historical occurrences between that time and the formation of a unit-operating contract, but for the purpose of this hearing it may be sufficient to say that about 1944 we found ourselves in the position whereby Navy owned themselves approximately 26,000 acres, to which I have referred, and the remaining ownership was entirely in the Standard Oil Co. of California. These ownerships were so located in a manner commonly called checkerboarding that a unit operation of some kind appeared to be the only sound and feasible solution.

In this position the Armed Services Committee, or the Naval Affairs Committee then in the Congress, concurred, and cooperatively a contract was worked out with the legal sanction of the Congress by which there was arrived at a unit operation in which the Navy and the Standard Oil of California became partners.

In order to carry out the spirit of the naval petroleum-reserve laws and the policies of the Congress, this law provided a number of essential features, one of which is that the control of the rate of production from the field lies in the Secretary of the Navy. Through the operation of the laws and the policy of the Congress, the operations under this contract have been the subject of continuous consultation with the Naval Affairs Committee and later the Armed Services Committee, and I think it is fair to say that no major policy has been embarked upon without full discussion and agreement with this committee.

It is for that purpose that this matter has been brought to the attention of this committee: To continue that relationship.

In view of the purposes in the law, the Secretary of the Navy has exercised his authority to control the rate of production in the Elk Hills field and has consistently held that production to the absolute minimum necessary in peacetimes.

I might say the law provides that under conditions considered to justify such action the field may be opened to full production, but only pursuant to a joint resolution of the Congress. No such regulation is considered now to be in effect, although such a resolution was passed for World War II production and has never been repealed.

The Navy, therefore, considers itself bound to control the rate of production to such minimum figures as are justified for sound operating and engineering reasons.

The particular problem before the committee at this time relates only to one of the several zones. There are two major oil zones, plus a third of unknown extent, which is in the process of exploration. These three zones are the shallow zone, the Stevens zone, and the Carneros zone. This problem relates to the shallow zone.

The shallow zone is one which had been explored and developed to a certain extent before the establishment of the unit-operating agreement. It has seen a substantial amount of production. During World War II, by joint resolution of the Congress, which permitted a daily production of 65,000 barrels per day, the field was opened to production and so operated for several months.

At the completion of World War II, or the World War II active period, administratively the production in the shallow zone was reduced several times until at present it is approximately 6,500 barrels per day. Of this 6,500 barrels per day, under present circumstances, in accordance with the contract, approximately one-ninth becomes the property of Standard Oil of California and the other eight-ninths become the property of the Navy. That oil is then sold through public bidding, and the receipts accruing to the Navy are deposited in the miscellaneous receipts of the Treasury.

Parenthetically here, I might point out that same percentage applies, and the same principle applies, to any increases which are authorized at the present time. For instance, if the production goes to 30,000 barrels per day, eight-ninths of that oil becomes Navy's oil which has been sold and those receipts are deposited in the Treasury.

While it is not the purpose and intent, no doubt, of the Congress to sell this oil at this time as a major objective, as an incidental objective and as an incidental result some $20 million per year will be deposited in the Treasury.

Mr. KILDAY. Was the reduction to 6,500 barrels a day submitted to the committee?

Captain MEADE. It was certainly reported to them. I do not think that the committee has ever objected to a reduction, Mr. Kilday. I cannot say whether it was done under consultation.

Mr. STOLZ. I am quite certain it was done in consultation with Chairman Vinson.

Mr. KILDAY. I am not sure whether a reduction as well as an increase was submitted.

Captain MEADE. The committee has always been fully informed. Consultation was had with the chairman of the committee before the reductions were made.

Mr. SMART. That just about covers the background and brings us down to date.

At this point I would like to put into the record what I shall designate "Exhibit No. 1," which is the letter of the Under Secretary of the Navy to Mr. Vinson, the chairman of the House Armed Services Committee, dated August 15, which letter advises the committee of the contemplated action to increase production.

Mr. KILDAY. Does that letter contain the reasons for the advisability?

Mr. SMART. It does.

(The letter referred to is as follows:)

EXHIBIT NO. 1

DEPARTMENT OF THE NAVY,
OFFICE OF THE SECRETARY,
Washington, August 15, 1952.

Hon. CARL VINSON,
Chairman, Committee on Armed Services,
House of Representatives, Washington, D. C.

MY DEAR MR. CHAIRMAN: This letter refers to the unit-plan contract between the Navy and the Standard Oil Co. of California for the operation of naval petroleum reserve No. 1 (Elk Hills), California, made pursuant to the act of Congress approved June 17, 1944 (Public Law No. 343, 78th Cong., 2d sess.), and particularly refers to production from the shallow oil zone.

During 1944 and 1945, the field at Elk Hills was opened to emergency production pursuant to a joint resolution of Congress authorizing such production, and for a period following that time certain amounts of production were authorized during the so-called primary period which pursuant to the law and the contract allowed Standard Oil Co. of California to receive oil from the shallow oil zone to compensate them in part for entering into the contract. That primary period ended August 2, 1950. By order of the Secretary of the Navy, production was reduced from 65,000 to 15,000 barrels daily in August 1945, and further reduced

to 8,450 barrels daily in May 1946, which amount was deemed necessary for a variety of engineering reasons. Under the law and the contract, the Secretary of the Navy is authorized to permit production of these reduced amounts, and there currently is being produced approximately 6,200 barrels per day of oil from the shallow oil zone. This production has, of course, been regularly reported to the Congress. In general, however, the production results from a necessary program to maintain the field in a state of readiness to produce for future national emergencies and to provide for the maximum ultimate recovery from the field in accordance with the provisions of the unit-plan contract. Some production results from the testing of new development wells and the necessity to protect the reserve from drainage in a small area in the southern portion of the field.

Pursuant to the terms of the contract, the Secretary of the Navy has had available to him the advice of an engineering committee consisting of three members representing Standard Oil Co. of California and three members representing the Navy, and operations have been in the hands of an operating committee of two, one representing Standard Oil Co. of California and one representing Navy. Acting with the advice of these committees and the advice of the Director, Naval Petroleum Reserves, it has thus far been found possible to limit production from the shallow oil zone to the amounts that have been previously mentioned and reported to you.

In this connection it might be said, parenthetically, that the Secretary has recently caused to be made a routine review of the operations of the naval petroleum-reserve program by the Navy's Industrial Survey Board, which operates under the Navy's Inspector General. Because of the special nature of the problem, the regular Navy members of the Industrial Survey Board were joined by a distinguished group of civilian experts representing various phases of the oil industry, and the Secretary has been very gratified to have that group report to him that the engineering advisers upon whom we have relied are thoroughly capable and competent in their field.

The Engineering Committee under the unit-plan contract has, as part of its duties, kept the engineering phases of the various producing zones in the Elk Hills reserve under continuous study. As a result of these studies, they have unanimously come to the conclusion and have recommended that for certain reasons, which will later be discussed and all of an engineering nature relating to the question of maximum ultimate recovery from the field, it is in their opinion necessary now to make a substantial increase in the amount of production from the shallow oil zone. The Operating Committee and the Director, Naval Petroleum Reserves, concur in these recommendations and the question has been presented to the Secretary for approval of the substantial increase in production recommended. The Secretary of the Navy has been advised that he has the authority to authorize this production; but in view of the implications present in these recommendations, and further in view of the long history of close consultation with your committee on these matters, it is desired to acquaint you fully with the circumstances and to give you an opportunity to consult in any fashion which you may consider appropriate.

In brief, the recommended additional production, as stated above, is necessary to protect the field against irrevocable losses of oil from the shallow oil zone. One of the specific requirements of the contract is that the field shall be so operated as to provide for the maximum ultimate recovery. In such loss, if it should be allowed to occur, both Standard Oil Co. and the Navy would share. It is in the direct financial interest, therefore, of the Government and of Standard Oil Co. to follow such engineering practices as would give reasonable assurance against these possible losses. On the other hand, any material increase in the current production is bound with time to reduce substantially the amount of production which can be expected to be available upon the occurrence of a future national emergency. After careful review of all the recommendations, it appears necessary to accept that fact and to proceed to protect the field against losses. It is desired to assure, however, that your committee is made aware of this fact in this situation. There follows in the ensuing paragraphs a brief description of the considerations which influence those in the Navy charged with the duty of administering the naval petroleum-reserve program to conclude that additional production is necessary.

The need to produce a sizable amount of oil from the shallow oil zone results, in general, from reservoir problems inherent in this type of reservoir from which approximately 204,000,000 barrels of oil have been produced since its discovery in 1919. There are forces within and extraneous to the reservoir which, coupled with structural and stratigraphic features of the reservoir itself, cause a state of

nonequilibrium with consequent necessity of production to preclude loss. The specific cases in the shallow oil zone, wherein it has been found that additional production is necessary and also in other cases which are currently under study where it is anticipated that additional production may be necessary, are discussed briefly below:

I. In the southeast portion of the shallow oil zone, in what is known as the 77–2G area of the SS–2 sand, it is found that encroaching water from the northeast and the low pressures to the south are conducive to movement of the oil in this sand into the aquifer to the south with resultant loss of recoverable oil. The conclusion has been reached that continuous additional production from the wells in this area in the amount of approximately 3,100 barrels per day is necessary to prevent loss of recoverable oil and to some extent to maintain the availability of productive capacity from existing wells.

II. With regard to the SS–1 sand on the south flank of the shallow oil zone, it is estimated that a down-dip migration of approximately 1,500,000 barrels of oil per year into water sands is occurring because of higher pressures existing up-structure than those down-structure. Migration of oil into the aquifer to the south, unless arrested, would result in loss of an estimated 50 percent of the ultimate recovery of the oil so migrated and in the need to drill additional wells to recover what oil might still be recoverable. It is believed that the only practical way to correct this situation is to endeavor to reverse the existing pressure gradients through production of down-structure wells, which will increase daily production by approximately 6,500 barrels per day. Such production may not succeed in reversing the pressure gradients, in which case the continuation of such approximate rate of production would be necessary to provide for the maximum economic ultimate recovery from the field.

III. It is estimated that 2,000,000 barrels of oil per year in the SS–2 and M sand of the south flank of the shallow oil zone are migrating down-dip into water sands. The migration of oil into water-wet sands results in loss of ultimate recovery and availability of oil for emergency production. In order to correct this situation as soon as possible, it is planned to eliminate, if possible, the unfavorable pressure gradients by the production of wells in the gas cap and oil band in this sand. The actual production program to be followed is currently under study, but it is estimated that it will result in a maximum increase of 13,000 barrels per day during the time required to correct the pressure gradients. If the program to be recommended proves successful, continued production for this purpose will not be necessary; if unsuccessful, it will be necessary to continue the production.

IV. Current production averages approximately 4,000 barrels of oil per day and 16,000 barrels of water per day from the north and east flanks of the shallow oil zone for the purpose of preventing further encroachment of water into the oil reservoir, which water invasion results in loss of productive capacity and loss of maximum ultimate recovery. Studies of this problem currently being made indicate that additional water production is necessary to hold back the encroaching water. Attendant to this additional water production from existing wells, it is anticipated that additional oil production of approximately 2,000 barrels per day will be necessary.

The foregoing engineering matters have been under detailed study for some time by the operating and engineering committees, who have already made definite recommendations for increased production as outlined above with regard to the 77–2G area and the SS–1 sand on the south flank; they still have under study the problems of migration in the SS–2 and M sand on the south flank and the water encroachment on the north and east flanks, but it is anticipated that they will recommend further additional production within the next months.

Based upon the advice received, and subject to any consultation that you may desire, the Secretary of the Navy therefore proposes to authorize the additional production from the shallow oil zone thus far recommended and also to authorize other additional production, if after due consideration, it is found that such production is justified for similar engineering reasons. Such production, when authorized, would be subject to continued review, and production would be reduced if allowed by sound engineering principles.

The Navy will stand ready to confer with you or your committee, or to provide any additional information which you may consider necessary.

Sincerely yours,

FRANCIS P. WHITEHAIR,
Under Secretary of the Navy.

Mr. SMART. Then, as exhibit No. 2, I would like to introduce in the record my letter, written in the absence, and for the chairman, of September 2, 1952, to Mr. Whitehair, wherein I stated that I thought it would be advisable to hold a conference on this matter and further requested that any proposed increase in production be held in abeyance pending the holding of that conference, and advising the chairman of the committee and other interested members. Of course, that leads us to this conference.

(The letter referred to above is as follows:)

EXHIBIT NO. 2

SEPTEMBER 2, 1952.

Hon. FRANCIS P. WHITEHAIR,
Under Secretary of the Navy, Department of the Navy,
Washington 25, D. C.

DEAR MR. SECRETARY: In the absence of Mr. Vinson, I am responding to your letter of August 15 with reference to the proposal of the Navy to increase the oil production from Naval Petroleum Reserve No. 1 (Elk Hills), California.

It appears that a daily increase of approximately 24,600 barrels over the present daily production of 6,200 barrels, would be required to provide for the maximum ultimate recovery from the field and to protect the field against irrevocable losses of oil from the shallow oil zone, which losses would be shared by both the Standard Oil Co. and the Navy.

It is my judgment that Mr. Vinson would wish to be fully advised of all the considerations which prompt this request for an increase in the oil production at Elk Hills. Inasmuch as there are a number of technical considerations involved, I do not feel that I can give Mr. Vinson an adequate picture of these considerations until I have had an opportunity to discuss them with the Director of Naval Petroleum Reserves and such members of the Engineering Committee as you may deem advisable to fully present all of the considerations involved. Such a discussion would necessarily include the details of substructural conditions which produce the pressure variations which are resulting in the drainage of oil from the structure.

Upon conclusion of the foregoing conference, I will contact Mr. Vinson by the most expedient means, personally if necessary, in order that he may be fully advised before making any decision as to the type of action which he desires the committee to take in passing judgment upon this question. In the meantime, may I respectfully suggest that this matter be held in abeyance.

Sincerely yours,

ROBERT W. SMART, *Chief Counsel.*

Captain MEADE. May I say, Mr. Smart, that the Navy, as usual, is respecting the wishes of the committee as you have requested, and action on the proposed increase is being withheld pending further word of your pleasure.

Mr. SMART. Let the record show the members of the Navy EngineeringCommittee. Will you state those for the record?

Mr. STOLZ. Yes.

Captain MEADE. I will ask Captain Stolz, the chairman of the Engineering Committee, and president, to give the full names of the present Engineering Committee.

Mr. SMART. I would like the record to show the background of the chairman of the Navy side of the Engineering Committee.

You may proceed on the record.

Mr. STOLZ. My name is Harry P. Stolz. I am a partner in the firm of Stanley Stolz & Dodson, consulting petroleum engineers and geologists of Los Angeles.

This firm and its predecessors have been in business for 22 years.

I am a graduate in geology of Stanford University and hold a master of science and engineering degree in petroleum engineering from the University of Southern California. I am a registered professional petroleum engineer in the State of California.

I first became associated with the naval petroleum reserves in 1938, when, as a Naval Reserve officer, I was voluntarily assigned to the Naval Petroleum Reserves Advisory Board. I was called to active duty on June 1, 1940, and assigned to the Office of Inspector, Naval Petroleum Reserves, in California.

I was closely associated with the negotiations of the original and sometimes called rescinded contract between Standard Oil Co. of California and the Navy, and I also took part in the negotiations under the present contract.

I was commanding officer and senior officer present, and a Navy member of the operating committee at Naval Petroleum Reserve No. 1 at Elk Hills.

Under the old or rescinded contract drill was commenced with some 4 strings of tools and some 15 wells were completed, and then development work ceased due to the so-called rescinding of the original contract.

I should possibly point out that after the extension of the boundaries of Naval Petroleum Reserve No. 1 by an Executive order of President Franklin D. Roosevelt, I believe in 1941, the extension of Naval Petroleum Reserve No. 1 was created.

Under the boundaries of the old reserve a portion of the productive zones of Elk Hills were east of the then east boundary and were lands which had been producing since 1920, fee-owned lands of the Standard Oil Co. of California, and Government-leased lands by the Richfield Oil Corp. of California.

Mr. SMART. Just outline your background briefly and name the other members, and we will get to that other picture in a minute.

Mr. STOLZ. I might say that a full detail of my background was submitted to the Naval Affairs Committee, and the Lands Committee of the House in 1942 and 1944, I believe.

Mr. SMART. Who are the other members?

Mr. STOLZ. The other members of the committee are Mr. W. E. Walker and Mr. Louis McNaughton. Those are the Navy members of the Engineering Committee under contract NOD–4219.

The members representing Standard Oil Co. of California are Mr. Arthur Turman, immediate past chairman, Mr. Wendell Erdley, and Mr. Victor Wankowski. Mr. Wankowski is also the Standard member of the operating committee and Mr. Walker is the Navy member of the operating committee.

I act also as the alternate to the Navy's member of the operating committee.

Mr. SMART. Is there any specific point as to the time when the engineering studies which led to this decision to increase started, or is it an accumulation of data since the entire operation of the field began?

Captain MEADE. I think I may answer that in this way, Mr. Smart, for many years there has been concern as to the problems under the general technical heading of reservoir engineering, we may say, in this particular zone. The problem has been under study for a number of years. The particular solution that we have now attempted to reach is a result of specific questions addressed to our engineering committee after an agreement between Navy and Standard as to what questions were necessary and the solutions that would be required. Those questions were addressed to the engineering committee about January of this year.

The engineering committee has given most intensive attention to those questions and has arrived at their conclusion and offered recommended solutions which have within the past several months reached the attention of the Navy.

Mr. SMART. May I ask what was the source of the questions to which you refer?

Captain MEADE. I, as director, asked the engineering committee to analyze the question and offer a solution. The Standard Oil Co. addressed a similar letter with questions that they considered needed to be answered.

Mr. SMART. At what point, as to time, did you come to a decision?

Captain MEADE. As the letter points out, even today, the points have not been arrived at to where there is a final solution. Further investigation involved production, its observation in result, as necessary before anything like a final solution could be reached. However, the first of the specific recommendations on which your letter is based were made in June and July of this year.

Mr. SMART. And they formed the basis of this letter of Under Secretary Whitehair to the committee?

Captain MEADE. Yes.

Mr. SMART. And of course that decision was basically to increase production because it was in the public interest; is that correct?

Captain MEADE. Yes.

Mr. SMART. I think at this point we should get down to specific things, but first let me ask what is the estimated potential production of the shallow zone in this Naval Petroleum Reserve No. 1?

Captain MEADE. That is a very difficult question to answer exactly, Mr. Smart.

Mr. SMART. That is the reason I used the word "estimated."

Captain MEADE. It is of the order of 50,000 to 60,000 barrels a day over an extended period of perhaps 5 years. For briefer periods a substantially larger production could be obtained.

Mr. SMART. What would be the maximum?

Captain MEADE. In the opinion of our Engineering Committee Chairman I would not use a figure higher than 75,000 barrels per day.

Mr. STOLZ. With a rapid decline.

Mr. SMART. The decision which you have reached to go from approximately 6,500 barrels daily production at present to something between 30,000 and 31,000 barrels per day—was that a unanimous decision on the part of both the Navy representatives and the Standard Oil Co. representatives considering these problems?

Captain MEADE. Yes, it is unanimous. It is based upon the unanimous recommendations of the Engineering Committee as such, the operating committee as such, and of the Director's separate personnel review. The Director, in reaching his decision, obtained additional advice from consultants and the Secretary therefore has relied upon unanimous advice of all who have been in a position to advise him.

Mr. SMART. Are those engineering reports available to the committee, Captain Meade?

Captain MEADE. Yes. They can be obtained and made a matter of record.

Mr. SMART. Before we discuss making them a matter of record I would like to know how voluminous they are.

Mr. KILDAY. Why could not we include in the record the specific recommendations?

Captain MEADE. They are in the Secretary's letter.

Mr. KILDAY. Identical?

Captain MEADE. Yes.

Mr. SMART. At this point let me refer to the Secretary's letter, page 3, item No. 1. These are the first four items which in the aggregate justify the Navy's position and Standard Oil's position that production should be increased. I will read this into the record.

"1. In the southeast portion of the shallow oil zone, in what is known as the 77–2G area of the SS–2 sand, it is found that encroaching water from the northeast and the low pressures to the south are conducive to movement of the oil in this sand into the aquifer to the south with resultant loss of recoverable oil. The conclusion has been reached that continuous additional production from the wells in this area in the amount of approximately 3,100 barrels per day is necessary to prevent loss of recoverable oil and to some extent to maintain the availability of productive capacity from existing wells."

In the first place, Captain, that, of course, is a net increase of 3,100 barrels?

Captain MEADE. Yes.

Mr. SMART. Would you, or a member of your Navy group, state for the record in a little more detail just what this means?

Mr. STOLZ. The map entitled "Edge Water Encroachment, SS–1 Zone, Map 5–A," depicts the area under consideration for the increased production south at Elk Hills.

At the time of commencement of operations under the Navy-Standard contract, many old wells had been drilled in Elk Hills and some 250 million barrels of oil had been extracted from the shallow oil zone reservoirs. The producing wells had been drilled under old practices wherein a multiplicity of zones had been opened to production in the individual wells.

Map marked "No. 1–D" depicts the oil zones which are a part of the shallow oil zone, they being the above scalex sand, the first subscalex sand, the second subscalex sand, the mulinia sand, and the submulinia sand.

With the mandate of the Congress to increase the production at Elk Hills to 65,000 barrels a day, some 300 oil wells were drilled and completed within a little over 1 year. An attempt was made to use the best engineering practices, and the majority of the new wells were drilled to a surface spacing of 1 well to 10 acres, but with a subsurface spacing of 1 well to 20 acres in the individual members of the shallow oil zone.

Production was rapidly increased and reached at one time a maximum of something over 70,000 barrels a day.

Due to the necessity of the rapid production, good engineering principles could not be strictly adhered to, and consequently withdrawals in many areas of the shallow oil zone were more than they should have been to meet good reservoir practices. The Elk Hills shallow oil zone is peculiar to itself in many respects, particularly so due to the fact that on the north flank and east nose there is a high head edgewater which has been encroaching since the field was first discovered.

On the other hand, a very unusual aspect as far as oilfields are concerned is the fact that there exists what appears to be a regressing edgewater; that is to

say, the edgewater on the south flank is seemingly migrating away from the oil sand and permitting oils to migrate down, dip into the water wet gray sands, thus permitting a loss of oil which in the opinion of the engineering committee will be a loss that will be rendered, and is being rendered, unrecoverable.

Captain MEADE. I would like to say in somewhat less technical language that what Captain Stolz has just mentioned represents the heart of the program—that essentially on the northern part of the field there is a water movement moving into the field and on the southern part of the field there is a water movement moving away from the field; therefore, there is a condition of movement and instability whereby, due to the encroachment of water from the north there is a potential loss of oil, and due to the movement of the water away from the south there is a potential loss of oil unless these conditions be corrected by actual production.

Mr. KILDAY. Because of the withdrawal of too much oil in the high-production period the reservoir decreased, and I suppose your gas pressure decreased, permitting the water to move into the lower oil reservoir, and at the same time moving into the sands because that water had gone out?

Mr. STOLZ. That is more or less correct. Possibly I should indicate that in the various members of the shallow oil zone, the various sands, the pressures are not identical, and due to the fact that in the old days since wells were drilled into all the zones that were opened we have had, and there exists, intercommunication between the various members of the zones.

Mr. KILDAY. Those wells were drilled before the development of conservation practices?

Mr. STOLZ. Right, sir.

Mr. SMART. Then it actually boils down to a matter of pressures which you say are not constant throughout the shallow zone?

Mr. STOLZ. It is that, sir. The difference in pressures has created pressure gradients.

Mr. SMART. Then, on the northern flank?

Mr. STOLZ. On the northern flank the encroachment of water is permitting the water to get into the oil-bearing sands has, from our experience, reduced the productivity of those sands. Once the water has, as we say, hit the clean oil well, the affinity of the water to the sand has created what might be termed a barrier, or a dam on the face of the sands in that well which keeps the oil from entering it, but permits the water to enter it. The fact that the permeability, the ease to flow of fluids in the oil sands is of such a variance as to be between what we term in petroleum engineering technology 200 or 300 millidarcys to as high as 20,000 millidarcys permits the water when it encroaches to go up the more permeable stretches of sands and get into well bores and intercommunicate between zones.

Mr. KILDAY. Do I understand the Secretary's letter to be that the increased production of oil will also serve to take out four times as much water each day and thereby reduce the water into which the oil is seeping?

Mr. STOLZ. That is correct, sir. We intend to attempt to retard the encroachment of the water. We want to reduce the water before it encroaches further up structure into the oil sands and thus reduce our recoverable reserve.

Mr. KILDAY. And then you will get the water and the oil out separately, or the major portion of it?

Mr. STOLZ. They come together out of the pumping wells, and then of course they are separated.

Mr. KILDAY. So as you produce 1 barrel of oil you produce 4 barrels of water?

Mr. STOLZ. Comparatively so. It will vary from well to well, of course.

Mr. SMART. Then, returning to this item No. 1 and trying to summarize the situation, you will be required, in your best judgment, to produce an additional 3,100 barrels a day in the southeastern portion of the Shallow oil zone because of water encroachment, principally from the northeast?

Mr. STOLZ. That is right, sir.

Mr. SMART. Will that production be from existing wells, or will it require new wells?

Mr. STOLZ. I will have to ask for some assistance.

Mr. ADAMS. It will require three new wells.

Mr. SMART. Three new wells, and they will be drilled at whose expense?

Mr. STOLZ. The Navy pays eight-ninths and Standard one-ninth at this time.

Commander CARSON. I might answer that. Under the provisions of the unit plan contract, these wells are not wells for readiness maintenance purposes but for immediate production, the cost would be shared currently by the Navy and Standard, sir.

Mr. SMART. So it would be a joint enterprise, any new wells for this purpose?

Commander CARSON. Yes; that is correct.

Mr. SMART. Now, let us then go to item No. 2, which reads as follows:

"II. With regard to the SS–1 sand on the south flank of the shallow oil zone, it is estimated that a down-dip migration of approximately 1,500,000 barrels of oil per year into water sands is occurring because of higher pressures existing up-structure than those down-structure. Migration of oil into aquifer to the south, unless arrested, would result in loss of an estimated 50 percent of the ultimately recovery of the oil so migrated and in the need to drill additional wells to recover what oil might still be recoverable. It is believed that the only practical way to correct this situation is to endeavor to reverse the existing pressure gradients through production of down-structure wells, which will increase daily production by approximately 6,500 barrels per day. Such production may not succeed in reversing the pressure gradients, in which case the continuation of such approximate rate of production would be necessary to provide for the maximum economic ultimate recovery from the field."

Now, what do you say as to that situation? Can you elaborate on it, and refer again to your map 5–A and explain the pressure situation?

Mr. STOLZ. Continuing studies have been made of all engineering features and reservoir characteristics of the shallow oil zone reservoirs, and the available data very definitely depicts the results in the summation given in the above statement to the Secretary of the Navy.

Mr. SMART. This point assumes, or at least states, that you have a higher pressure up-structure than you do down-structure and therefore the oil is migrating down-structure at the rate of 1,500,000 barrels a year, which oil is going to be lost irrevocably both to the Navy and to Standard. So your proposal there is to drill additional wells which will attempt to reverse this pressure trend which is causing the loss of this oil?

Mr. STOLZ. That is correct, sir.

Mr. SMART. That being true, where would you drill the wells, up-structure, to relieve the pressure, or down-structure?

Mr. STOLZ. This matter of the SS–1 sand migration of the south flank will concern the producing of oil from presently drilled wells in the reservoir.

Mr. SMART. At what part of the reservoir? Where are these wells?

Mr. STOLZ. These wells are located on the south flank of the SS–1 sands and will be produced in an attempt to reverse the pressure gradients so that all can be recovered before it migrates into the previously water-wet unproductive water sands.

Mr. SMART. And that total increase in production is now estimated to be 6,500 barrels daily increase?

Mr. STOLZ. That is correct.

Mr. SMART. Now let us go to the third item, which I shall read into the record.

"III. It is estimated that 2,000,000 barrels of oil per year in the SS–2 and M sand of the south flank of the shallow oil zone are migrating down-dip into water sands. The migration of oil into water-wet sands results in loss of ultimate recovery and availability of oil for emergency production. In order to correct this situation as soon as possible, it is planned to eliminate, if possible, the unfavorable pressure gradient by the production of wells in the gas cap and oil band in this sand. The actual production program to be followed is currently under study, but it is estimated that it will result in a maximum increase of 13,000 barrels per day during the time required to correct the pressure gradient. If the program to be recommended proves successful, continued production for this purpose will not be necessary; if unsuccessful, it will be necessary to continue the production."

The item apparently intends that this pressure situation be coped with by production, or increased production of existing wells and the drilling of no new wells?

Mr. STOLZ. That is correct, sir.

Item III is similar to item II except that it concerns the second scalez sand and the mulinia sand, whereas item II concerns the first sub-scalez sand.

Mr. SMART. There being different production sands within the shallow oil zone?

Mr. STOLZ. Right, sir.

Mr. SMART. We will now go to item IV, which I will read:

"IV. Current production averages approximately 4,000 barrels of oil per day and 16,000 barrels of water per day from the north and east flanks of the shallow oil zone for the purpose of preventing further encroachment of water into the oil reservoir, which water invasion results in loss of productive capacity and loss of maximum ultimate recovery. Studies of this problem currently being made indicate that additional water production is necessary to hold back the encroaching

water. Attendant to this additional water production from existing wells, it is anticipated that additional oil production of approximately 2,000 barrels per day will be necessary."

This item states that current production averages about 4,000 barrels of oil per day and 16,000 barrels of water from the northeast flank of the shallow zone. Would you care to elaborate as to what causes this situation and what you propose to do, just in layman's terms?

Mr. STOLZ. Item IV concerns the encroachment of edgewaters on the north flank and east flank.

Mr. SMART. Right there, this is the same water encroachment that you previously referred to, or is it different from that referred to in item I where you had water encroachment from the northeast?

Mr. STOLZ. It is somewhat similar to the water encroachment from the northeast. The northeast water encroachment is due somewhat to the general encroachment of water from the north.

Mr. SMART. Would you explain, in terms of the layman, how you propose to alleviate this situation?

Mr. STOLZ. Due to the unequal pressures in the various members of the shallow oil zone, if the water is not produced it will be permitted to encroach up-structure and very materially damage and render unproductive much of the oil in the shallow oil zone.

Mr. SMART. Does this assume that there are certain wells located along the fringe areas where the water is encroaching on the oil, and it is at those fringe areas where you propose to block the water off, or prevent it from migrating further into the structure of the oil?

Mr. STOLZ. That is it. It will also involve the drilling of some additional wells.

Mr. SMART. How many, would you now estimate?

Mr. STOLZ. Thirty-six new or replacement wells.

Mr. SMART. What is a replacement well as contrasted to a new well?

Mr. STOLZ. A replacement well is a well that would have to be drilled in place of a well that is in poor mechanical condition and cannot be producing, or a well that has been abandoned.

Mr. SMART. In essence it is a new well?

Mr. STOLZ. In essense, it is new.

Mr. KILDAY. Do you mean by that that you are going to close down one for each one that you open?

Mr. STOLZ. Well, sir, we have many old wells which are now some 30 years old, and as you probably well know, the type of casing used some 30 years ago is not the equal of what is being used today. The pipe has gone bad, and in some cases the oil liners have collapsed, and in order to produce this water they will have to do remedial work—possibly redrill and clean out, and in many cases it will be cheaper to drill a new well than to go in and fool around with one of the old ones.

Mr. KILDAY. Practically, the change came within the last 30 years—in the last 5 years?

Mr. STOLZ. Yes; that is true.

Mr. KILDAY. Do you encase them in concrete in this area?

Mr. STOLZ. Yes; we cement all the wells a considerable distance up above the casing shoe.

Mr. KILDAY. That is a rather recent practice, is it not?

Mr. STOLZ. In one sense it is. Our modern technique in oil well cementing is much improved over what it was some 30 years ago.

Mr. SMART. This is estimated to make a net daily increase in production of 2,000 barrels per day. As I compute the total sum of the four items that we have covered here, they total 24,600 barrels of oil as a daily net increase over existing production, which we will say for the record is approximately 6,500 barrels; therefore, assuming that all these things were done, we would have a daily production of about 31,100 barrels of oil, as contrasted to 6,500 barrels today.

Proceeding with you estimate of the potential production in this field of 50,000 barrels a day for an estimated period of 5 years—and I recognize all you can do is to give your best "guesstimate" at this point—I compute that to be a potential of about 75 million barrels of oil in the shallow oil zone; is that correct?

Captain MEADE. During this 5-year period of which you have spoken, I think that is so. The actual recoverable oil in the shallow zone presently is estimated at 350 million approximately.

Mr. SMART. In the shallow zone?

Captain MEADE. Yes. That is estimated recoverable oil at the present time in the shallow zone. It would be approximately 350 million barrels of oil.

Mr. SMART. Under what time of recovery? That is not on the basis of 50,000 barrels a day, is it?

Captain MEADE. On any basis of reasonable production that is not excessive to damage the field. The estimated recovery is approximately the same. That might be increased by such unusual measures as water flooding, or other secondary recovery methods, so-called.

Mr. SMART. Well then, my point was—I was trying to see what the net effect on the shallow zone reserve would be by implementing the plan that you propose here of going to, say, 30,000 barrels a day for a 5-year period. But this is going to be, in my judgment, if it is done, not a 5-year period. I think once it is done it is done forever, and that this production will be maintained at 30,000 barrels for ad infinitum, and even on a 5-year basis that would result in an increase in production of some 45 million barrels of oil. I was trying to determine the net effect of your proposal upon the reserve in the shallow zone.

Captain MEADE. I strongly concur in your conclusion, sir, that we are embarking on something of a relatively permanent nature. I see little prospect of ever reducing to the conditions under which we are presently operating in the order of 6,000 or 6,500 barrels per day. A production such as you have estimated in round numbers of approximately 30,000 barrels per day amounts to about 11 million barrels per year. That, of course, is something like a reduction in the recoverable oil of approximately 3 percent per year at present rates. I may say that, in my opinion, once any field reaches a certain age and has reached a certain stage of development, the production of the field becomes almost an inevitable thing sometimes. Our problem has been one of holding back as long as we could. We have now reached the point where we cannot hold back without the loss of oil, and of course that question of loss of oil is one which is very close to all of us. The contract itself provides that we must so operate the field as to look for maximum recovery.

Mr. SMART. May I interject right there? With regard to your reference to the unit plan contract, could you cite for the record at this point the particular clause in the contract which vests in the Secretary of the Navy the authority to operate this field in such a manner as to insure a maximum ultimate recovery?

Captain MEADE. Yes. I may say that we have had opinions from the Judge Advocate General to the effect that the Secretary not only has the right, but he has the duty to produce the field in the manner recommended.

I would like for Commander Carson, who is my counsel, to give you more particular reference in answer to your question.

Commander CARSON. In the unit-plan contract, under the recitals, paragraph 6 (d) (VI) it says that one of the objects of the unit plan of development and operation is to result in securing the maximum ultimate recovery of oil, gas, natural gasoline and associated hydrocarbons from the reserve.

Mr. SMART. That is the responsibility, under the law, of the Secretary of the Navy, to so operate the field to insure maximum ultimate recovery?

Commander CARSON. That is correct, sir. However, I would like to point out that there is another objective of the unit-plan contract which is also recited in the contract, which is to place the reserve in a condition of readiness where it will be able promptly to produce oil in substantial quantities whenever the strategic situation of the United States in the future may so require.

Mr. SMART. Of course, that condition does not today exist—requiring any maximum production?

Commander CARSON. Not any present production, but the Secretary feels it is his duty there under the law and under the contract, to drill sufficient wells, and to install sufficient facilities, so that we will have this capacity available in time of war or emergency, and when it becomes necessary in the national defense.

Now, those two recitals which I have given you might at some time be somewhat conflicting because if you wanted to get, say, 75,000 or 100,000-barrels-a-day capacity out of the shallow-oil zone, which would certainly be well beyond its maximum economical recovery capacity factor, but you decided that you needed it in the national defense—that you had to have that 100,000 barrels of oil—it might not be a maximum economical recovery from the field because if you produced the field at rates higher than were engineeringly possible you would not recover as much oil as if you did it according to good engineering practices.

Mr. SMART. That, to me, brings us to the crux of the whole situation. The sole justification for the Navy being in this operation at all is to operate, develop, and maintain a petroleum reserve, keeping the maximum amount possible in the earth in a state of readiness for a future national emergency.

Commander CARSON. That is correct.

Mr. SMART. Now, this situation here seems to be in total and in utter conflict with that philosophy of the Navy, which brings me to what I believe to be my final question. In spite of the fact that your primary objective is to keep the maximum amount of oil in the ground, do you feel that if you are to serve the best interests of the Government, that you should by all means go to this plan outlined in the Under Secretary's letter of August 15 and increase the production by some 25,000 barrels a day—in spite of that conflict in philosophy?

Mr. KILDAY. And with regard to whether there is a question as to a conflict, how about the obligation for maximum recoverable oil in the pool?

Captain MEADE. In my opinion, there is no fundamental conflict, or if there is such, it is always possible to resolve it in accordance with certain principles. For instance, it is clearly the primary purpose of a naval petroleum reserve to retain in the ground for an emergency period the maximum amount of oil ready to be produced. On the other hand, the conduct, administration, and operation of the field must be in accordance with good, sound, and sensible business principles. There must not be any avoidable waste.

I may say that the Congress itself has shown concern at all times in the past when it has felt that there might be a possibility of loss of oil by drainage to the other owners. In such places as Elk Hills and at reserve No. 3 in Teapot Dome it has been well established that the committee has the right and the duty to produce oil whenever, in the absence of such production, that oil will be lost. It is therefore only a matter of degree rather than a difference in principle that occurs. The same principle occurs when we are faced with a situation where production is required to prevent actual physical loss of recovery of oil in the ground in our reserves.

In accordance with well-established past principles, I am able to say that I have advised the Secretary of the Navy, and am prepared to advise the committee, it is in the best interests of the Government to proceed with the recommended production.

Mr. SMART. I do not know whether you share my opinion or not, but going to a production of 30,000 barrels a day seems inevitably to me to say that we had just as well write off the shallow zone as a naval petroleum reserve.

Captain MEADE. I would not say that is so; no, sir.

Mr. SMART. If I am wrong, tell me so on the record.

Captain MEADE. In my opinion, you are correct in principle that we are accepting the fact that production in the shallow zone will eventually reduce its availability to a point where it is no longer a naval petroleum reserve. As to timing, I would find a different opinion. I believe that even after 6 or 7 years of production, such as we now contemplate, this shallow zone would have a very substantial value as a naval petroleum reserve in time of emergency.

Mr. SMART. Assuming the correctness of your justification of this proposed action, and assuming that it does deplete to a certain degree the potentiality, it is still your position that the action is mandatory in the public interest and is an obligation of yours, both under the law and the contract?

Captain MEADE. Yes.

Mr. KILDAY. What would be the effect on this field, or any other field, if you completely shut it down?

Captain MEADE. That question has been one of very great concern to me personally, Mr. Kilday, as it should be to all of us. I have asked the Engineering Committee specifically what effect such action would have on this field. I have been advised that if the field were shut in completely there would be a substantial loss in ultimate recovery from the field.

Mr. KILDAY. That is generally true of any oil field, is it not?

Captain MEADE. Yes.

Mr. KILDAY. You run the risk of losing?

Mr. STOLZ. Not generally so. We might consider the Stevens zone at Elk Hills, which is a new field and which can be kept shut in for a hundred years with probably not even the loss of a barrel. The shallow oil zone is an old field which has been producing for 22 years under competitive operation

Mr. KILDAY. Of course, the difference there is that the Stevens zone is more or less in the condition in which you found it?

Mr. STOLZ. It is virgin.

Mr. KILDAY. But, after you start tinkering with it and disturbing nature, that would not be so, and this contract recognizes that when it says: "Navy deems it inadvisable to shut in the well on Navy's land forthwith in view of possible permanent damage to the well or to the national interest in the ultimate economical

production of oil therefrom, and in view of the probable drainage of oil from the Navy's land in the event lands not controlled by Navy are developed and operated without simultaneous protective development and operation of Navy's land."

Are we in such a present situation that the take is so low that you are running the same risk as this recital C said was to be avoided; that is, the total shutdown would permanently damage it? Is this present take of 6,000 barrels a day so low as to endanger the field?

Captain MEADE. I think that is a correct conclusion.

Commander CARSON. I certainly think so.

Mr. KILDAY. The recommendation is based entirely on engineering and geological advice. The situation is one that comes about entirely from the structure that we have here in the movement of oil and water. The problem was submitted to the Joint Engineering Committee and it is unanimously recommended that this action be taken?

Captain MEADE. Yes.

Mr. SMART. I have intentionally pursued my questions with the Navy because they are in the position of serving the public interest. The Standard Oil Co. very understandably is in the position of trying to serve itself, and very properly so, and get the maximum oil that it can. That is the sole reason for its existence.

May I ask the senior representative of the Standard Oil Co. present at this conference if he fully concurs, from an engineering and geological standpoint, that the facts and the position as outlined by the Navy are sound?

Mr. THATCHER. Mr. Chairman, my name is John H. Thatcher, assistant to Mr. F. S. Bryant, vice president and director, and I am here in Mr. Bryant's absence, he being out of the country.

We appreciate the invitation of Mr. Smart to be permitted to attend this discussion, and we appreciate the invitation of Captain Meade to join the group here. We are in accord with the recommendations of the Engineering Committee as submitted to the Operating Committee and in accord with the recommendations of the Operating Committee. If you would care to ask any technical questions, we would be glad indeed to endeavor to answer them, but we feel that the recommendations as submitted are fully explanatory and, in our opinion, entirely justified.

We have with us today the chief petroleum engineer of our company, Mr. A. F. Turman, who is a past chairman of the Engineering Committee, and with him Mr. Richard Adams, petroleum engineer of the staff at Elk Hills. If Mr. Turman has any further comment on the recommendations submitted, with your permission, Mr. Chairman, I would be glad to have him make a statement at this time.

Mr. SMART. Do you have anything to say for the record with regard to your personal position as the Standard representative in this group?

STATEMENT OF A. F. TURMAN, CHIEF PETROLEUM ENGINEER OF THE STANDARD OIL CO. OF CALIFORNIA

Mr. TURMAN. My name is A. F. Turman, chief petroleum engineer of the Standard Oil Co. I have been a petroleum engineer with the Standard for something over 32 years, and almost all of that time I have been in more or less intimate contact with the development and production at Elk Hills.

We have seen a great many changes in the techniques and great increases in our knowledge of subsurface conditions.

I think the recommendations that have been made by the Engineering Committee have been more thoroughly thought out and threshed out by the differences of opinion among the members of the committee than any similar problems with which I have been closely associated. I am in full accord with the recommendations that have been made.

Mr. KILDAY. I realize that we are not in the exact position of the landowner and the royalty owner or holder, though it is very similar. In petroleum law, where you have the situation of the holder of a lease of the mineral in deed operating the management and production of the oil, a situation arises from an engineering or geological reason that causes a loss of oil through this type of seepage, would the royalty holder have any legal right to compel the holder of the lease or the deed to take all proper steps and measures to secure maximum production?

Commander CARSON. I think that is true in all oil-producing States that I have any particular knowledge of.

Mr. KILDAY. They have the right to compel offsets in all of them, do they not?

Commander CARSON. They have the right to compel offsets, and the courts recognize there is an implied covenant in the lease in the absence of an express covenant which requires the operator, or the lessees, to drill offset wells to prevent drainage; and, to that extent, as you have pointed out, this is a sort of parallel case.

Mr. KILDAY. It is not quite identical.

Commander CARSON. It is not quite identical, but we have somewhat the same situation. There is oil being lost. The Navy under the contract has absolute control of the rate of production, and we feel that we must also take into account Standard's interest in the field, which is a very substantial interest, and they are, while probably not legally, at least practically a partner in the operation of the field, and as provided by the contract and as required by law, we feel that we have a duty to do whatever may be necessary to protect the field.

Mr. SMART. The situation here is somewhat analogous to another situation at Barksdale field, which you probably remember, Mr. Kilday, where a very substantial petroleum deposit was found adjacent to the border or the boundary limits of Barksdale. The Department of the Interior has received a permit for allocating these lands in order that they may be leased to private interests, which would offset on the Government land the private wells on the outside in order to prevent loss to the Federal Government.

Mr. KILDAY. They have been leased at a very high rental and a very handsome bonus.

Mr. SMART. All in the best interests of the Government, presumably, so this would constitute a loss. While it does not involve offsetting, the principle is exactly the same: to protect the Federal interest.

There is one final thing that I would like to show for the record. I do not think, in the first instance, it is pertinent to these facts here, but in order that the record at all times may be clear I would like to develop just this one point. Perhaps Mr. Thatcher would be the proper gentleman for me to address my remarks to—this production at the present time of some 6,500 barrels, of which one-ninth is the Standard's interest, and eight-ninths is the Navy's interest, Standard can take its oil and do whatever it wishes with its one-ninth and the remaining eight-ninths belongs to the Navy. They sell it by competitive bid on the open market. Am I correct in stating that because of the rate structure for the purchase of crude petroleum in the Elk Hills, or in the California area, that Standard has not up until this time participated in the competitive bidding for the Navy oil which is sold from Elk Hills?

Mr. THATCHER. I will be happy to answer that question. In approximately April of 1951 the Navy offered its oil for competitive bidding in accordance with law, and at that time the Standard Oil Co. of California, along with several operators, offered to purchase the oil from the Navy, from the shallow zone, which is the zone at issue. The Navy, in appraising those bids elected to accept the bid of the Wilshire Oil Co., and it is my understanding that the oil is now being sold by the Navy to the Wilshire Co. pursuant to a contract with the Navy, whose members, of course, can give you further background. We are not currently a purchaser of any oil owned by the Navy produced either from the shallow zone or the Stevens zone, but in answer to your direct question, we did bid on the shallow zone oil.

Mr. SMART. By the same token, you along with everyone else, be he an individual or a company, who requires crude petroleum in his business operations, would be in a position to bid on the Navy's share of this increase of 24,600 barrels per day if this plan is implemented?

Mr. THATCHER. I believe that Captain Meade and Commander Carson probably prefer to comment on that rather than myself.

Captain MEADE. We have presently a contract, as Mr. Thatcher has said—in fact, two contracts—with the Wilshire Oil Co. relating to the disposal of our oil. Those contracts provide for a 3-year period of which a little over 1 year has run. The contract is so drawn that this increase contemplated would go to Wilshire Oil Co. under the same contract. It is only in the event of a change involving production to us, pursuant to a joint resolution of Congress, that there would be a new sale, or until the completion of the present contract.

Mr. KILDAY. Was the Wilshire bid better than Standard's bid at the time the contract was granted?

Captain MEADE. Yes. They were the best qualified bidders.

Mr. SMART. How much longer has the Wilshire contract to run?

Captain MEADE. Something less than 2 years.

Commander CARSON. About the middle of July 1954.

Mr. SMART. Until the expiration of the Wilshire contract Standard would not be in any position to make a competitive bid for any of this increased production?

Captain MEADE. That is correct.

Mr. KILDAY. When I asked the question whether Wilshire's bid was better, I did not mean that Standard was held to be an unqualified bidder. It was given to the highest bidder.

Captain MEADE. They had a right to bid and they were considered as a qualified bidder.

Mr. KILDAY. Did they have any advantage over any other bidders because of the fact that one-ninth of the take is to be disposed to them and they could increase their facilities for handling and so on?

Captain MEADE. The Standard is specifically not allowed under the law to have any advantage in obtaining the oil. They must bid competitively.

Mr. KILDAY. Because of the fact that they would have one-ninth of the production to be disposed of would they then have an advantage in that they could expand the facilities they have in the disposal of it?

Captain MEADE. The only answer I can give to that is that they have never been able to outbid anyone else, so at least there is no presumption of any advantage.

Mr. SMART. I did not want to make, and I do not want the record to indicate, any inference that there was any impropriety in this matter, but I did want the record to show clearly the facts governing the disposition.

Mr. KILDAY. The record should reflect all the facts about it.

Mr. SMART. I want that clearly understood, both by the Navy representatives and the Standard representatives. For my part, Mr. Kilday, I have no additional questions.

Mr. KILDAY. I have none.

Mr. SMART. Do any of the members attending this conference have anything to say, anything they would like to add to the record up to this point?

(No response.)

Mr. KILDAY. The meeting will stand adjourned.

The CHAIRMAN. The chairman wants to express his appreciation for this comprehensive, very clear, precise picture that has been given the members of the committee.

I think we realize what our problem is. The decision is really to be made by the Secretary of the Navy, but in consultation with this committee. We have as our first witness this morning Capt. R. H. Meade, who is the Director of the Naval Petroleum Reserve.

Captain Meade, be seated, and proceed. We are glad to have you with us this morning. We want to thank the Navy through you, and express our appreciation to the Navy for their fine cooperation in keeping this committee informed and apprized of all of the transactions that have taken place between the Navy and Standard Oil.

STATEMENT OF CAPT. ROBERT H. MEADE, DIRECTOR OF PETROLEUM RESERVES, UNITED STATES NAVY

Captain MEADE. Thank you, Mr. Chairman, and I, in return for the Navy, would like to thank you, sir, and your committee, for giving us the opportunity to consult with you on this problem and to obtain the benefit of your advice.

I am Capt. Robert H. Meade of the Civil Engineer Corps of the United States Navy, present Director, Naval Petroleum Reserves. I shall present a brief history of Naval Petroleum Reserve No. 1 (Elk Hills, Calif.) and the pertinent events leading up to the matter presently before this committee, namely, the recommended increase in production from the shallow oil zone of Elk Hills.

On June 25, 1912, the Secretary of the Navy requested the cooperation of the Secretary of the Interior in securing the reservation for the Navy of oil-bearing public lands in California, sufficient to insure a supply of 500,000,000 barrels of oil. In response to this request the

Geological Survey recommended an area of some 38,000 acres in Elk Hills, Kern County, Calif.

Accordingly, President Taft issued an Executive order, dated September 2, 1912, creating Naval Petroleum Reserve No. 1.

The only private owner of lands inside the reserve was the Standard Oil Co. of California. Standard adhered to an understanding with the Navy to the effect that neither would drill any wells inside the reserve without 6 months' notice to the other.

Pursuant to this understanding, Standard's lands within the reserve continued to be largely undeveloped and unproduced.

A certain portion of the Elk Hills field, however, which was then outside the limits of the reserve, was produced under normal commercial practice. It was therefore necessary for the Government to issue strip leases within the reserve and bordering the competitive production, in order to protect the Government land from drainage of oil.

Under these circumstances, by 1942 some 153 million barrels of oil and a large volume of gas were produced from the eastern part of the shallow oil zone, the so-called old area.

On October 15, 1942, President Roosevelt signed an Executive order enlarging the limits of the reserve to the east to include the lands which had been produced in the past and which were on the known geologic structure of the shallow oil zone.

By the act of June 17, 1944 (Public Law No. 343, 78th Cong., 2d sess.), the Navy was granted congressional authority to enter into a unit-plan contract with Standard for unitization of the reserve. On June 19, 1944, the unit-plan contract, authorized by Congress and approved as to its legality by the Attorney General prior to its execution, was entered into with Standard. By the terms of the contract, the entire reserve is operated as a single property or unit in which Navy and Standard are the only participants. Under the contract, Navy acquired absolute control over the rate of exploration, development, and production.

Naval Petroleum Reserve No. 1, as provided in the act of June 17, 1944, can be produced for emergency use pursuant only to legislation or joint resolution of the Congress. Emergency production from Elk Hills was authorized during 1944 and 1945; a production rate of 65,000 barrels per day from the shallow oil zone was attained in 1945. Following the war the production was reduced and has been held at the minimum necessary to develop and maintain the field in a state of readiness to produce in substantial quantities when authorized by the Congress and to protect the reserve against loss of oil. This production has, of course, been regularly reported to this committee. There is currently being produced for such purposes a total of approximately 7,800 barrels of oil per day from the shallow oil zone.

The current allocation of the production from the shallow oil zone is approximately eight-ninths to Navy and one-ninth to Standard.

The history leading up to this situation is as follows: Pursuant to the terms of the contract, production of 15,000 barrels per day was authorized during a primary period, all accruing to Standard's account. In 1945, after the close of hostilities, the rate of production was reduced from 65,000 barrels per day to 15,000 barrels per day; and in April 1946, by order of Secretary of the Navy John L. Sullivan, the rate was further reduced to 8,450 barrels per day. Production since that time has been within the figure so authorized.

By the terms of the contract, during the primary period, all oil initially produced was received by Standard, who thus received during the primary period approximately 28,000,000 barrels of oil.

This primary period ended on August 2, 1950. At that time other provisions of the contract then came into effect, whereby Navy then obtained its participating share of the oil, or approximately 67 percent plus two-thirds of Standard's share, or 22 percent, thereby giving to Navy approximately eight-ninths of the oil currently being produced.

The production now being recommended would, pursuant to the terms of the contract, be shared in similar fashion, approximately eight-ninths becoming Navy's share and the remaining one-ninth going to Standard.

Such allocation of the shallow-oil-zone production would continue until Navy and Standard are in balance in receipt of production, at which time they would share according to their participating interests; i. e., approximately two-thirds to Navy and one-third to Standard.

The unit-plan contract established an Operating Committee, composed of one Navy member and one Standard member, and an Engineering Committee, consisting of three Navy members and three Standard members.

These committees, as part of their duties under the contract, have kept the shallow-oil-zone readiness program under continual scrutiny and have revised the program during the past 7 years as warranted by new information and data. Acting with their advice and that of the Director, Naval Petroleum Reserves, the Secretary of the Navy has limited the production to the minimum necessary to maintain a ready and substantial productive capacity from the field and at the same time to prevent the loss of oil, as provided in the contract.

The Engineering Committee, as a result of their continuing study of the reservoir problems in the shallow-oil zone, came to a unanimous conclusion in the summer of 1952 that it is necessary to make a substantial increase in the rate of production from the shallow-oil zone in order to maintain the availability of productive capacity and to obtain maximum, economic, ultimate recovery of oil, as provided in the contract. I reviewed this matter with the Secretary of the Navy under the previous administration, and he concurred in the recommended increase in production from the shallow-oil zone. He was also advised by the Judge Advocate General of the Navy that he had an obligation under the terms of the contract to authorize the increase in production. The Secretary had caused to be made, about that time, a review of the operations of the naval petroleum reserves by the Industrial Survey Board, which operates under the Navy's Inspector General. Because of the special nature of the review, the regular Navy members of the Industrial Survey Board were joined by a distinguished group of civilian experts representing various phases of the oil industry. The Board reported to the Secretary that the engineering advisers upon whom we have relied are thoroughly competent in their field.

The Secretary thereupon, by letters of August 15, 1952, reported the matter to the chairmen of the Committees on Armed Services. I shall quote the pertinent paragraph from said letters. [Reading:]

> Based upon the advice received, and subject to any consultation that you may desire, the Secretary of the Navy therefore proposes to authorize the additional production from the shallow oil zone thus far recommended and also to authorize

other additional production, if after due consideration it is found that such production is justified for similar engineering reasons. Such production, when authorized, would be subject to continued review, and production would be reduced if allowed by sound engineering principles.

A conference was held on the matter on September 5, 1952, with certain members of the House Armed Services Committee. We subsequently received advice that the chairman of the committee desired to have a hearing on the matter before the committee in the 83d Congress. The Navy accordingly did not act on the recommended increase in production, but has deferred action pending further consultation with the Armed Services Committees.

In the ensuing time the Engineering Committee has continued to study the problems in the shallow oil zone and has reworked its recommendations in the light of the latest engineering information available.

The committee has just completed a comprehensive report on the subject entitled, "Review of State of Readiness Program, Shallow Oil Zone, 1945–52, Recommended Programs for Future Operation with Particular Reference to Present Losses of Availability and Ultimate Recovery." Copies of the report have been distributed to the members of this Committee on Armed Services. The report as it now stands recommends an increase in production of 18,100 barrels of oil per day from the shallow oil zone. One program of the report, namely the SS–2 and M on the south flank, is still under study and is pending results of testing now going on in the field.

The Secretary of the Navy in the administration of the naval petroleum reserves has relied upon the services of recognized consultants in petroleum engineering and geology. The services of the firm of DeGolyer & MacNaughton have been utilized for many years on naval petroleum reserve matters and, in particular, with reference to Elk Hills. The firm of Stanley, Stolz, & Dodson also has been consulted for a long time on problems pertaining to Elk Hills.

Mr. G. E. Woodward of the firm of DeGolyer & MacNaughton has participated for a number of years in the meetings of the Elk Hills Engineering Committee and is well acquainted with the technical aspects of the reservoir problems in the shallow oil zone. I have asked him to make a statement to the committee explaining the engineering aspects of the recommended increase in production. I have present other technical advisers whom I did not plan to have make a formal statement but who will be available to answer questions.

I will, of course, be available, to answer any questions that the Committee may have concerning the contractual aspects of this matter.

With the chairman's permission, I would like to have Mr. Woodward present his statement.

The CHAIRMAN. What is our problem? The fact is, we are losing oil at the present time; are we not?

Captain MEADE. Yes, sir. We understand there are 5,000 barrels a day of oil being lost by becoming irrecoverable.

The CHAIRMAN. Unless it is drilled immediately, it will be irretrievably lost.

Captain MEADE. Yes.

The CHAIRMAN. By escaping and also by water contamination.

Captain MEADE. There are two processes which will be explained in this technical dissertation, but in effect there is a movement

of water into oil sands, on one side of the field, and on the other side a movement of the opposite effect.

Each of these is such that it produces a loss of irrecoverable oil.

The CHAIRMAN. Are you and the representatives of Standard Oil in agreement on this?

Captain MEADE. Our engineers, 3 of them representing the Navy, and 3 representing Standard, have submitted a report, which is before you, and signed by all of them, representing their agreement as to the summation of the problem, and the solutions recommended.

The CHAIRMAN. What is the Navy's recommendations?

Captain MEADE. The Navy's recommendation is to—may I suggest, sir, that would be well presented by Mr. Woodward in his technical presentation?

The CHAIRMAN. I should think that you, the Director of the Naval Reserves, are the one to tell us what the Navy recommends.

Captain MEADE. Yes, sir.

The CHAIRMAN. You are the chief. You are No. 1 man here. We want to know what you recommend to this committee.

Captain MEADE. Yes, sir.

The CHAIRMAN. Which is the wise thing and the economical thing?

Mr. GAVIN. Mr. Chairman, may I ask this question? I just want to clarify "the Standard." When you say "the Standard," who do you mean?

The CHAIRMAN. Standard of California.

Mr. GAVIN. Is it only the Standard of California?

Captain MEADE. Yes, sir. The Standard Oil Co. of California, is our partner in this unit operation.

The CHAIRMAN. We want to do what is best for the country, particularly from the standpoint of national defense.

Captain MEADE. Yes, sir.

It is my recommendation, sir—which as you have been advised has not yet been passed upon by the present Secretary of the Navy, although the report is before him—that the recommendations of the Engineering Committee, as contained in this report, be adopted.

The CHAIRMAN. Are there any questions?

Mr. VINSON. Mr. Chairman, I would like to ask a question.

The CHAIRMAN. Mr. Vinson.

Mr. VINSON. What is the effect of the recommendation?

Captain MEADE. The effect of the recommendation, sir, will be to require the drilling of approximately 39 wells in the shallow zone.

Mr. VINSON. Who pays for those wells?

Captain MEADE. The cost will be shared by the Navy and Standard, sir.

Mr. VINSON. It will require 39 additional wells?

Captain MEADE. Yes, sir.

Mr. VINSON. That will make a total then of seven hundred odd wells in the shallow zone?

Captain MEADE. That would bring it up now to a total of 680 plus 39, which would be 719, sir.

Mr. VINSON. 719 wells will then be drilled in Elk Hills?

Captain MEADE. That is in the shallow zone, sir.

Mr. VINSON. In the shallow zone.

Captain MEADE. Yes, sir.

Mr. VINSON. Then the recommendation of the Navy Department is that they will drill 39 new wells. What will those 39 wells cost?

Captain MEADE. Approximately $1,500,000, sir.

Mr. VINSON. $1,500,000?

Mr. COLE. Each or all?

Captain MEADE. All of them—total..

Mr. VINSON. The average depth will be about 3,500 to 3,600 feet?

Captain MEADE. Yes, sir.

The CHAIRMAN. How much oil will they produce? What will be your maximum production after drilling these 39 wells?

Captain MEADE. After drilling these wells, producing them in the manner recommended, and increasing production in existing wells, there is thereby contemplated in this report 18,100 barrels per day increase.

Mr. VINSON. If added to that the 6,200, that would be 24,300 barrels daily.

Captain MEADE. Yes, that is substantially correct.

Mr. VINSON. My recollection was the former Under Secretary recommended a total production, including this increased production, of about 30,000 barrels?

Mr. SMART. 24,500 net increase, Mr. Vinson.

Mr. VINSON. 24,000 net increase, making a total production of around 30,000 barrels.

Mr. SMART. 30,700.

Captain MEADE. He approved two of the items in this report, and such others as he could later accept, and at that time the engineering committee contemplated that they were talking in terms of 30,000 barrels a day production; yes, sir.

Mr. VINSON. So the committee can understand now, you are recommending to the new Secretary of the Navy that the increased production will be brought about in the amount of 18,000 barrels by the drilling of 39 wells?

Captain MEADE. Yes, sir; plus the increased production of certain existing wells.

Mr. VINSON. All right.

Now, what is the increased production of certain existing wells? What does that amount to?

Captain MEADE. That is included within the 18,000.

Mr. VINSON. Well, then, the committee can understand that this increased production will only amount to, in total sum, 18,000 barrels?

Captain MEADE. Yes, sir, on the basis of our present recommendations.

Mr. VINSON. And you submitted that to the Secretary?

Captain MEADE. Yes, sir.

Mr. VINSON. And the Secretary is studying that now?

Captain MEADE. Yes, sir.

Mr. VINSON. And he has not yet reached a decision regarding that?

Captain MEADE. So I understand, sir.

Mr. VINSON. How long will this increased production of 18,000 barrels be required to protect the field from the migration and infiltration?

Captain MEADE. To a certain extent, Mr. Vinson, the production recommended has experimental features, so the time cannot be

really known, but in my opinion, we must take the risk, on the basis of this report, that that production will continue indefinitely.

Mr. VINSON. Then the committee can understand from the statement you just made that there will probably be a constant production, or at least a minimum of around 24,000 barrels a day from this shallow zone?

Captain MEADE. I would think that we might expect that for some time; yes, sir.

Mr. VINSON. How long would it be before the shallow zone is exhausted then at that rate? How many years before the shallow zone will be gone, assuming somebody figured it out?

Captain MEADE. A straight mathematical computation of that kind, that would be about 15 years.

Mr. VINSON. Then the committee can understand now, the shallow zone will fade away in approximately 15 or 20 years?

Mr. GAVIN. I think that is yet to be determined.

I just want to say, Mr. Chairman, you cannot say definitely it is going to be 15 years.

Mr. VINSON. The gentleman is an expert.

Mr. GAVIN. I am not an expert, and I am not an oilman. I am not an expert in the oil field.

The CHAIRMAN. Gentlemen, let the witness answer.

Captain MEADE. In answer to your question, sir, when an oilfield produces, it does not produce uniformly in that simple arithmetical fashion that we have just been discussing. The producibility of a well falls off in accordance with the well-recognized curve. It would be a useful field, even with these corrected measures for a substantially longer period than this simple computation would show, but it eventually would run out.

Mr. VINSON. Now, so the public can understand, and the committee can understand, it is going to be necessary to draw out around 24,000 barrels of oil daily out of the shallow zone. You estimate there are 350 million barrels in there now, so it can easily be figured how many years the shallow zone will live?

Captain MEADE. Yes, sir.

Mr. VINSON. Under the unit-plan contract, you are now in what is known as the secondary period?

Captain MEADE. The primary period is ended; that is right.

Mr. VINSON. Under the secondary period Standard gets one-ninth and the Government gets eight-ninths?

Captain MEADE. Yes, sir.

Mr. VINSON. The public is sold the eight-ninths.

Captain MEADE. Yes, sir.

Mr. VINSON. And Standard takes its one-ninth and does with it what it wishes.

Captain MEADE. Yes, sir.

Mr. VINSON. If you go from the primary period to the secondary period, what happens?

Captain MEADE. The primary period was specified as that period required to allow Standard to withdraw approximately 28 million barrels as part of the compensation for them to enter into this contract.

Mr. VINSON. When they withdrew that 28 million barrels, then automatically under the terms of the contract that puts them in what you generally call the secondary period?

Captain MEADE. Yes, sir.

Mr. VINSON. Did the engineers make any report as to the condition of seepage of water when the Standard had drawn out its requirements?

Captain MEADE. It is my understanding that the engineering problems of the field were under study in that committee, at that time. I have no knowledge or recollection of any specific report on this problem being made coincident with the end of the primary period.

Mr. VINSON. When was it first called to your attention, or who called it to whose attention that there was a seepage and a flooding?

Captain MEADE. I assumed duty as Director of Naval Petroleum Reserves in December of 1950, and prior to that time I had the advantage of 6 months of duty as the deputy to my predecessor, Commodore Greenman. During that indoctrination period it was thoroughly explained to me that there were very serious engineering problems in this field, and that their effect was then unknown, but that a study was under way in an attempt to ascertain the results. As time has gone on, during my incumbency as Director, various engineers with whom I have consulted, of my staff, have developed aspects of growing importance which tended to show the possibility of trouble from losses of oil in this field. In January of last year, Mr. John Thatcher, of Standard Oil, and I were in consultation on problems in relation to this contract, and particularly with relation to some suggested changes, and Mr. Thatcher reminded me, and I agreed, that the problem of possible losses of oil in this field should be solved. And as a result of that, our Engineering Committee were given some specific and pointed questions to go to the heart of this problem and to satisfy both parties to the contract that all necessary information was being obtained. Partly as a result of that, and partly as a result of the fact that the subject was already under study, the Engineering Committee came up with their reports about June or July of last year, by which several of the recommendations contained in this final report were defined and others suggested. The intervening time has been occupied by the Engineering Committee in refining and improving their recommendations to form this formal report which is before us.

Mr. VINSON. So the committee can understand, this problem was beginning to shape up at the suggestion of Mr. Thatcher, a member of the Engineering Committee, and after consultation with you?

Captain MEADE. He is not a member of the Engineering Committee, sir. He is an official, an assistant to the vice president of Standard Oil of California.

Mr. VINSON. I see. Who is the Standard's members of the Engineering Committee?

Captain MEADE. There are three members, sir.

Mr. VINSON. Now the committee only consists of three, doesn't it?

Captain MEADE. Three members representing each party.

Mr. VINSON. That is right. There are six?

Captain MEADE. Yes, sir.

Mr. VINSON. All right. You need not give that. After consultation with Mr. Thatcher, you and he propounded the same questions to the six members known as the Engineering Committee?

Captain MEADE. Yes, sir. We separately propounded similar questions.

Mr. VINSON. Who originated the thought, was it you or Mr. Thatcher?

Who originated the idea there was water seeping into the field from the north and east, and migration at the south end of the field?

Did you find that out from the previous reports, or did you find it out through conference with Mr. Thatcher?

Captain MEADE. I would say the basic thought or apprehension as to the idea was put in my mind during my indoctrination period with Commodore Greenman.

Mr. VINSON. All right. The Navy and you originated the thought there sould be a further study to determine whether or not the field was being dissipated by water coming in or oil going out?

Captain MEADE. I do know who originated it before I came into it, but certainly the parties joined in the analysis of the study.

Mr. VINSON. All right, as a result of that study—it doesn't make much difference, but just to keep the record clear—as a result of that study the engineering members have recommended that the 18,000-barrel increase from the entire field, daily, take place?

Captain MEADE. Yes, sir.

Mr. VINSON. Making a total of 24,200?

Captain MEADE. Yes.

Mr. VINSON. Now, at this time you are drawing out 6,200 barrels?

Captain MEADE. Approximately; yes, sir.

Mr. VINSON. Standard gets one-ninth of that?

Captain MEADE. Yes, sir.

Mr. VINSON. How many barrels is that?

Captain MEADE. About 700 barrels a day.

Mr. VINSON. 700 barrels. They have only been getting 700 barrels since what date?

Mr. SMART. August 2, 1950, when the secondary period went into effect.

Mr. VINSON. That is right. Since 1950, since the secondary period went into effect, they have only been getting one-ninth of the total of 6,200 barrels a day.

Captain MEADE. Yes, sir.

Mr. VINSON. Under this proposal can you tell the committee how many barrels Standard will get out a day?

Captain MEADE. They will get approximately—it will be one-ninth of approximately 24,000, which would be about 2,700 barrels.

Mr. VINSON. About 2,700 barrels. What is the difference between 700 and 2,700?

Captain MEADE. 2,000.

Mr. VINSON. There will be an increase to Standard of 2,000 barrels on this.

Captain MEADE. That is correct.

Mr. VINSON. All right, Mr. Chairman, thank you very much.

The CHAIRMAN. Mr. Gavin.

Mr. VINSON. Wait one moment, sir.

Mr. Chairman, for the record, I want to state, as a member of the committee, I have a statement of some engineers who offered some alternative suggestion. The Secretary of the Navy called me the other afternoon and stated he understood I was asking that he appear

before the committee, and to make the record complete for the committee in his official capacity. I was going to ask the chairman to pass it up because it was his responsibility, and I told him about this memorandum. He asked me to send it to him, so I sent it to him. Now I want to ask the captain, will he contact the Secretary and get that memorandum so that we can have the benefit of the conclusions that our engineers make in regard to those alternative methods of protecting the field?

Captain MEADE. I would be very happy to do so.

The CHAIRMAN. No doubt the Secretary will furnish that when he comes to testify before us.

Mr. Gavin?

Mr. GAVIN. Captain, there is nothing definite about having a definite production. You can't say definitely that you are going to get 18,000 or 24,000, or how long the field is going to hold out. That is probably mathematical, isn't it? The field may "peter out" or it may go on for 30, 40, or 50 years, but it will rapidly decline?

Captain MEADE. It will certainly decline. Just how fast is a matter of engineering judgment, sir.

Mr. GAVIN. That is right. It is probably mathematical.

Captain MEADE. Yes, sir.

Mr. GAVIN. Let me ask you, Captain, how do you sell the oil?

Captain MEADE. By law, Mr. Gavin, we are required to sell our share of the oil after public advertising. The oil that is now being produced has been sold after public advertising and there is presently a 3-year contract with Wilshire Oil Co. of California, by which we dispose of our Navy share of oil.

Mr. GAVIN. What is that crude worth out there now?

Captain MEADE. It is about $2 per barrel, approximately.

Mr. GAVIN. If we put $1,500,000 in drilling these 39 wells, how long do you think it will be before we get our investment back?

Captain MEADE. We will get our money back rapidly, Mr. Gavin. With this kind of production we would be taking in $20 million a year.

Mr. GAVIN. As long as it holds up.

Captain MEADE. Yes, sir.

Mr. GAVIN. It is a shallow field?

Captain MEADE. Yes, sir.

Mr. GAVIN. I have no further questions.

Mr. HÉBERT. Captain, as I understand it you direct all the oil reserves for the Navy.

Captain MEADE. Yes, sir.

Mr. HÉBERT. The entire oil reserves of the Navy?

Captain MEADE. The seven pieces of property Mr. Smart described; yes, sir.

Mr. HÉBERT. How many similar reserves as Elk Hills does the Navy have?

Captain MEADE. There is only one field like Elk Hills, really developed and ready as a military reserve.

Reserve No. 2 is Buena Vista Hills, south of Elk Hills. It is entirely leased out. Reserve No. 3, in Wyoming, is completely shut in. We have been exploring it recently but it is not used. No. 4 in Alaska, is in the process of an exploration program.

The three oil shale reserves are consigned to the Navy for custody, but by law we are not permitted to develop or operate them.

However, the Bureau of Mines is conducting experimental work at their experimental and development plant at Rifle, Colo.

Mr. HÉBERT. In other words, this is the only active reserve you have under the Navy jurisdiction at this time?

Captain MEADE. Yes, sir.

Mr. HÉBERT. You have that in partnership with the Standard Oil Co. of California.

Captain MEADE. Yes, sir.

Mr. HÉBERT. Is that the common practice of the Navy as far as oil reserves are concerned?

Captain MEADE. It is the only case, as far as I know, and it took a special act of the Congress to do it.

Mr. HÉBERT. Has the Navy explored oil?

Captain MEADE. Not outside of its jurisdiction.

Mr. HÉBERT. I am trying to establish the policy of the Navy in exploring oil.

Captain MEADE. We have explored within our own reserves; yes, sir.

Mr. HÉBERT. The Navy has explored itself?

Captain MEADE. Yes, sir; we are doing so in Alaska, and we have ended up such a program in Teapot Dome, Wyo.

Mr. HÉBERT. You have the equipment to do the exploring?

Captain MEADE. We have done such work by contract, sir.

Mr. HÉBERT. I am trying to arrive at the fact the Navy does have to enter into a contract with a private organization to do the actual work of exploring.

Captain MEADE. That is correct.

Mr. HÉBERT. The Navy does not have its own equipment to explore.

Captain MEADE. There is some Government-owned equipment in Alaska. We have found it expedient on that type of contract to buy our own equipment. The purchasing is done by the contractor and the drilling is done by the contractor.

Mr. HÉBERT. Outside of this one operation in Elk Hills, has the Navy entered into any contract with a private oil company?

Captain MEADE. None that have come to my attention. I don't think there have been any others ot this nature.

Mr. HÉBERT. What does the Navy get out of this? I notice you plan to pay $1.5 million to put the rigs up, and give Standard Oil 2,800 barrels a day. What does the Standard Oil Co. furnish?

Captain MEADE. There is a complex contract, sir, which provides for the ultimate division of the oil, in accordance with participating percentages, and the ultimate sharing of costs. The production of oil was put out of balance by the terms of the contract, Standard getting during a primary period approximately 28 million barrels of oil for compensation for coming into the deal.

The Navy pays initially the development costs. These are shared ultimately. The operating costs are shared. The Navy sells its oil and deposits about $4 million a year in the Treasury. Standard uses its oil. There are incidental products sold, such as gas, natural gas——

Mr. HÉBERT. By whom?

Captain MEADE. By the Navy. We sell ours. I don't know what Standard does with theirs.

Mr. HÉBERT. Boiled down, the Standard Oil Co. got 28 million barrels for operating or exploring, the cost of construction is shared equally by the Navy and Standard Oil; is that correct?

Mr. VINSON. No.

Captain MEADE. Ultimately that is correct; yes, sir.

The CHAIRMAN. Go ahead and answer.

Mr. HÉBERT. He said it is correct.

Mr. COLE. It is shared two-thirds Navy and one-third Standard ultimately.

Captain Meade. The products and the pipe and the costs are shared equally, but ultimately.

Now, the out-of-balance provisions occurred by reason of the operation contract. Standard presently is out of balance in both respects. But the ultimate operation of the contract definitely provides you get your equitable share of the products and you pay your equitable share of the costs.

Mr. COLE. That is quite different than saying you are equal.

Captain MEADE. If I said equally, I was in error, sir.

Mr. JOHNSON. Proportionately, sir.

Captain MEADE. Proportionately.

Mr. HÉBERT. Let me ask this, Captain:

As I understand it—I'm just trying to clarify the record—as I understand it, Standard Oil was in Elk Hills before World War II by contract with the Navy; is that correct?

Captain MEADE. The contract was in 1944. Yes, sir; they were there.

Mr. HÉBERT. A little before that, weren't they?

Captain MEADE. They were there many years before that.

Mr. VINSON. Mr. Chairman, will the gentleman yield?

Mr. HÉBERT. Certainly.

Mr. VINSON. Just bear this thing in mind: There are 38,000 acres of ground there which was set aside by President Taft; 12,000 acres belongs to Standard, and it is checkered all over this area.

Then they entered into an arrangement and agreement whereby Standard would pool its interests and we would pool our interests, and so in that way the unit-plan contract came to life.

Standard, under the terms of the contract, was permitted to draw so many barrels of oil for coming in and putting that oil in the common pool.

Mr. HÉBERT. That is correct. Standard Oil did develop the field. That was what I wanted to know.

Captain MEADE. No, sir.

Mr. VINSON. Not at all. Standard went in on its own land, and began to drill. Then the Government began to put in offset wells. That continued until both parties were cutting each other's throats, and then we said to Standard: "Let's all be partners and get together." So, we got together under the unit-plan contract; then the Navy went in and began to develop the deal, and Standard posted part of the cost of the development, and all that was worked out.

Mr. HÉBERT. That is my point.

Mr. GAVIN. May I ask a question, Mr. Chairman?

The CHAIRMAN. Mr. Hébert.

Mr. HÉBERT. Just a second.

In other words, I am trying to develop exactly the part Standard Oil played in developing the field. My impression was, until Mr. Vinson clarified it, that the Navy was drilling its own wells in that field, and then the Standard Oil was drilling offset wells, and they came into conflict.

Mr. MILLER. The opposite.

Mr. HÉBERT. Just the reverse. And then the Standard Oil was drilling and the Navy put in the offset wells.

Mr. VINSON. The Standard went in and drilled on its own land.

Mr. HÉBERT. Then they came in conflict.

Mr. VINSON. To protect the Government interest we began to drill wells on our land. That went on for a period of time until we got this agreement with Standard.

Mr. HÉBERT. That is correct.

So, in other words, now, the policy of the Navy, in the activation or the exploration of this oil reserve, would be to enter into an agreement with a private oil company; is that correct?

Captain MEADE. Well, it has been necessary in this case, sir, because of the fact that there were two owners in this area.

Mr. HÉBERT. If there were not two owners, you would not have to do so.

Captain MEADE. No, sir.

Mr. HÉBERT. Is the Navy equipped to do its own exploration and to do its own production?

Captain MEADE. Yes, sir.

Mr. HÉBERT. It is?

Captain MEADE. By hiring contractors to do it for our account; yes, sir.

Mr. HÉBERT. I'm not talking about the physical operation of the mechanism; I'm talking about the ultimate production; that the Navy would be the sole responsible party to the actual production.

Captain MEADE. Yes, sir; that would be possible, for instance, if you develop Teapot Dome.

Mr. HÉBERT. Or any other oil lands that might come under the jurisdiction of the Navy.

Captain MEADE. If we owned it entirely.

Mr. HÉBERT. Is the Navy's policy to so explore, or to keep the oil in the ground for the next war?

Captain MEADE. Our policy is, when we have had a reserve, to explore and develop and have the field in a state of readiness. Elk Hills has reached that point. It is impossible to do it, in Buena Vista Hills, No. 2. We have been in the exploration stage, in the other two reserves.

Mr. HÉBERT. Would the Navy's policy be this: If any other reserves came under its jurisdiction, with possibilities of oil, would the Navy start immediately exploration and production?

Captain MEADE. Our advice has been, I believe, under the recent Attorney General's opinion, there would have to be new laws.

Mr. HÉBERT. What is that?

Captain MEADE. I understand if we received new reserves, in accordance with the Attorney General's opinion, we would have to have new laws.

Mr. HÉBERT. That is the most recent Attorney General you are speaking of?

Mr. MEADE. Yes, sir.

Mr. HÉBERT. In other words, nothing could be done unless they came before Congress to do it?

Captain MEADE. Yes, sir.

Mr. VINSON. May I ask a question?

Mr. GAVIN. Mr. Chairman——

Mr. VINSON. I yield.

Mr. GAVIN. When you went into this operation with Standard of California, you said there were 38,000 acres in this tract, and Standard had certain acreage within that tract, too.

How much acreage did the Standard have within the 38,000 acres?

Captain MEADE. About 12,000 acres.

Mr. GAVIN. On the question my colleague asked about the Navy's actually doing any of the work: The Navy itself carries on no part of this exploration, other than by contract with private firms and concerns; isn't that a fact?

Captain MEADE. Yes, sir.

Mr. GAVIN. You actually sublet to a petroleum engineering company that phase of the work you want investigated or carried on. The Navy actually doesn't do anything?

Captain MEADE. There has been an exception to that. In the early days of the war in Alaska we used Seabees, Naval Construction Battalions, to start the job. Since that time it has been taken over by contractors.

The CHAIRMAN. Mr. Wickersham.

Mr. WICKERSHAM. I wanted to ask a brief question of you, Captain:

Can you assure this committee, if the suggestion of the Navy and Standard Oil are followed, that there will be absolutely no criticism in the future of the Navy?

Captain MEADE. No, sir; I could not.

Mr. WICKERSHAM. The reason I asked it: We don't want to be criticized by the Teapot Dome phase.

One of my relatives was Assistant Attorney General under Taft. Can you assure this committee there will be no affair like Teapot Dome?

Captain MEADE. I have every reason to believe that there is a complete and utter absence of any factors such as appeared in the case you referred to, sir. I think the recommendations have been entered into openly and completely in good faith.

Mr. WICKERSHAM. Fine. That is all. Thank you.

The CHAIRMAN. Mr. Miller.

Mr. MILLER. I yield.

Mr. VINSON. I asked questions before.

Mr. MILLER. Referring to the questions asked by Mr. Gavin: Isn't it the general trade practice among oil companies to hire these groups of specialist petroleum engineers when it comes to exploring and developing fields?

Captain MEADE. Yes, sir.

Mr. MILLER. These people are especially equipped to do that, and they hold themselves out to all petroleum companies for that purpose?

Captain MEADE. Yes, sir; including drilling contractors, for instance.

That is common practice. Some companies do it for their own account, but most of them do not, I understand.

Mr. VINSON. Since we have a brief statement in the record on the shallow zone, I would like to ask you now in regard to the Stevens zone.

How many wells are in the Stevens zone?

Captain MEADE. There are approximately 180 wells at the present.

Mr. VINSON. How many?

Captain MEADE. 180 wells.

Mr. VINSON. 180 wells.

Now, the same thing will happen to the Stevens zone as is happening now to the shallow zone?

Captain MEADE. At the present time, that zone has been produced only slightly. It is, to the best of my knowledge, a very stable field. If it is put into production, and produced properly and uniformly—and it should be possible since we have complete control of it—we have no reason to suspect that we will enter into the same situation as we have in the shallow zone.

Mr. VINSON. Is there any need of putting the Stevens zone in production when the policy of the Congress is to reserve the oil in the ground?

Captain MEADE. The Navy has no intention of doing so without the authority of Congress.

Mr. VINSON. Is it your understanding at this time, that it is the policy of the Congress to reserve the Stevens zone oil in the ground?

Captain MEADE. Yes, sir; and any other zones.

Mr. VINSON. You can't do that in the shallow zone, because it will be gone in a short time. We hope, at least one member hopes, that you will try to save the Stevens zone. That is about all you are going to get out of it, as a reserve, over the course of time. From what you have said the shallow zone is going to fade away, but there is no need now to anticipate it will be necessary to draw any oil out of the Stevens zone?

Captain MEADE. That is my understanding; yes, sir.

Mr. SMART. Except for readiness.

Mr. HARDY. Mr. Chairman.

The CHAIRMAN. Mr. Hardy.

Mr. HARDY. Captain, what is the annual revenue from the sale of oil, as it is now being withdrawn, approximately?

Captain MEADE. Approximately $4 million, sir.

Mr. SMART. To the Navy, for its share.

Captain MEADE. To the Navy; yes.

Mr. HARDY. That is what I mean.

Captain MEADE. That goes into miscellaneous receipts of the Treasury.

Mr. HARDY. That goes into the miscellaneous receipts of the Treasury, and the Navy loses control over those receipts?

Captain MEADE. Yes, sir; we have to come to the Appropriations Committee for every cent of money the Navy spends in this field.

Mr. HARDY. Suppose you have a $20-million income, estimated; is that right?

Captain MEADE. Yes, sir; something like that.

Mr. HARDY. That is all.

Mr. COLE. Mr. Chairman.

The CHAIRMAN. Mr. Cole.

Mr. COLE. You say you estimate that by seepage and contamination the loss is 5,000 barrels a day?

Captain MEADE. Yes, sir; 5,000 barrels a day is the estimated loss caused by these migrations of fluid in the shallow zone.

Mr. COLE. This engineering committee, is it not a continuous committee?

Captain MEADE. Yes, sir.

Mr. COLE. Constantly looking after the operations out there?

Captain MEADE. Yes, sir.

Mr. COLE. Where was the committee between 1946 and 1950 when the recommendations resulted in a gradual decreasing of production?

Captain MEADE. The committee was very active in this area, sir. They were attempting to solve the problems of maldistribution of pressure by methods other than production of oil. They have tried gas injection. They tried closing up some of the old wells which had dual completions. They tried minor production, and they have, through that production, and their studies of pressures, now arrived at the point that all other practical solutions or possibilities of practical solution have been excluded and proved to be ineffective, and that therefore we can now resort only to the thing which we reluctantly recommend: that we must increase production.

Mr. COLE. What would be your estimated daily loss after you increase production to 24,000 a day?

Captain MEADE. Of course, our hope and objective would be to bring that down to zero. I dont know whether it is possible or not.

Mr. COLE. That is what I wanted to find out; whether that was your estimate; whether you eliminated the loss entirely, or simply reduced it?

Captain MEADE. Our objective is to get rid of it entirely, Mr. Cole.

Mr. COLE. The law imposes upon you a dual responsibility, one of keeping this reserve in readiness.

Captain MEADE. Yes, sir.

Mr. COLE. The other, at the same time, is to see no oil is taken out of it.

Captain MEADE. That is my understanding.

Mr. COLE. Two totally inconsistent obligations. Because you can't keep it in readiness, unless it has oil wells pumping all the time, and to the extent it pumps it decreases the reserve.

To me it is inconceivably incomprehensive; that you would be required to devise a system under the obligation of keeping the field in readiness which could result in the total depletion of the shallow zone in 10½ years.

Captain MEADE. Well——

Mr. COLE. I am wondering if the time hasn't come—of course, that readiness for provision of war was put in at a time we were in war. We didn't know when we would have to call on it. That situation does not apply now. I am wondering if it might not be advisable, if it is the policy of Congress, to keep the oil in the ground instead of taking it out, if we should take a look at that readiness qualification and perhaps change it.

Now, let me ask you: If the readiness requirement were not in the law, would it be necessary for you to pump 24,000 barrels a day?

Captain MEADE. Well, you mean if we were relieved of the duty of protecting the field against losses, entirely?

Mr. COLE. If your only obligation was to preserve the oil in the ground?

Captain MEADE. Yes, sir. If we were relieved of the duty of protecting the field against loss of recoverable oil, no production would be necessary.

Mr. COLE. Then this 24,000 you have now proposed has no relationship to your obligations from the standpoint of readiness?

Captain MEADE. Well, yes, sir; it does have a relation, because the productibility of the field is thereby affected. If we let the field alone, the readiness of the field will decrease faster than if we take these recommended measures.

Mr. COLE. In other words, if you shut down the field completely, you still continue to lose the 5,000 or more barrels a day?

Captain MEADE. Probably more, sir.

The CHAIRMAN. Mr. Bates.

Mr. BATES. Captain, I think we ought to try to get in the record, even though Mr. Gavin so well put it—it is difficult to know exactly, arithmetically, how many years this shallow zone will last under the new arrangement of taking out 24,000 barrels a day. But from my quick computation, it looks as though it is going to be four times the figure that has been given here.

In other words, it would be closer to 38 or 40 years, than it will be 12 to 13?

Captain MEADE. I would think 35 years would be something within reason; yes, sir.

The CHAIRMAN. Thank you very much.

Mr. BENNETT. May I ask a question?

The CHAIRMAN. Mr. Bennett.

Mr. BENNETT. Perhaps you already answered this question, but I didn't quite understand it.

Following what Mr. Cole has asked you, if the only objective of the Navy at the present time was to retain the maximum amount of oil for ultimate utilization by the Navy, would your recommendations be any different from the ones you made here this morning?

If your only objective was to save as much oil as possible underground, for ultimate use by the Navy, by the Armed Forces—if that was your only objective?

Captain MEADE. Would we do this?

Mr. BENNETT. Would you do that?

Captain MEADE. Yes, sir; we would have to do this; because that is one of the purposes of these recommendations: to increase the recoverable oil.

Mr. MILLER. Will the gentleman yield?

Mr. BENNETT. Yes.

Mr. MILLER. Captain, you couldn't do that in view of the fact Standard of California still has a vested interest in this field. If you even scrap your contract with them to go in—and try and preserve the field, they then would have a right to exploit their own properties; wouldn't they?

We would be back into the dog-eat-dog situation again?

Captain MEADE. The Secretary of the Navy under this contract has the right to control production absolutely, sir. Of course, you assumption is that the contract be abrogated and we go on our own?

Mr. MILLER. And Standard Oil could go on its own.

Captain MEADE. If we abrogated our contract; yes, sir.

Mr. VINSON. The contract was made, and Standard agreed that a fixed amount be pumped out of the ground?

Captain MEADE. Yes, sir.

The CHAIRMAN. Mr. Gavin.

Mr. GAVIN. I note here in this week's Time another deal up in Alaska: I don't know whether the Navy is in on that or not. Are they on this?

The CHAIRMAN. Well, I——

Mr. GAVIN. It just refers to how they are handling their contract. I was wondering who handles that, because it doesn't seem to fit in with the present method of handling.

Captain MEADE. I have no information on that.

Mr. GAVIN. What?

Captain MEADE. I have no information on that.

Mr. GAVIN. I might say for the edification of the committee how this has been handled:

> In awarding Phillips the first Alaskan oil development contract, the Government set stiff terms. Phillips will have to spend at least $1.2 million on exploration before June 30, 1956, and another 40 cents an acre on the million-acre tract every year thereafter. It must also sink 2 wells by 1956, start another 2 by the middle of 1958, and drill a well a year in each of the 2 adjoining districts—from 1959 to 1963, making a total of 12 wells in 10 years. Phillips will lose the rights to land it does not develop under the terms of the contract.

There are different circumstances.

The CHAIRMAN. I might say to the gentleman we will take up the other reserves at a later time. At this time let's confine this discussion to Elk Hills.

Thank you very much, Captain. We appreciate your coming before us.

We would like to hear now from Mr. G. E. Woodward, representative of DeGolyer & MacNaughton.

STATEMENT OF G. E. WOODWARD, VICE PRESIDENT, DeGOLYER & MacNAUGHTON

Mr. WOODWARD. Mr. Chairman, my name is G. E. Woodward. I am a member of DeGolyer & MacNaughton, and a vice president of that corporation.

I would like to state my qualifications by saying that I graduated from the California Institute of Technology in 1934.

For 2½ years thereafter I was employed by the Richfield Oil Co., as a petroleum engineer. For the following 6 years I was employed as a petroleum engineer by the United States Geological Survey, at Taft, Calif., where, incidentally, I had some connection at Elk Hills. That was in 1937.

The following 3½ years I was in the United States Navy; a large portion of the time was spent as a petroleum engineer with Commodore Greeman's office, the former Director of the Naval Petroleum Reserves.

The last 6½ years I have been with the consulting firm of DeGolyer & MacNaughton in Dallas.

I am here as the Navy's representative of the Engineering Committee to present this formal report, a copy of which each of you have,

and also to present a letter which has been prepared by Mr. MacNaughton, a copy of which you also have.

I have been asked to state the names of the members of the Engineering Committee. They are H. P. Stolz, who is the present Chairman, who has an alternate, Mr. C. S. Dodson.

There is also Mr. W. A. Walker and Mr. L. W. MacNaughton. I am Mr. MacNaughton's alternate on the Engineering Committee.

That group represents the Navy Department. For the Standard Oil Co. there is Mr. A. F. Turman, and Mr. Murray Putnam, both of whom have, as an alternate, Mr. W. G. Frailing. The third member fo the Committee for Standard is Mr. V. O. Wankowski, who has an alternate by the name of J. S. Surfluh. All of the men on this committee have qualified under the terms of the unit-plan contract. Nearly all are registered professional engineers.

I also am a professional engineer registered in the States of Texas and California.

If I may, I would like to correct perhaps a misapprehension Mr. Cole has in answer to one of his questions.

While we are talking primarily about the shallow zone today, the Stevens zone is owned approximately 80 percent by the Navy, 20 percent by Standard Oil Co. of California and production is shared in that relationship, not the one-ninth and eight-ninths basis.

Mr. WOODWARD. In the shallow zone it is eight-ninths against one-ninth.

The CHAIRMAN. It is 80–20 in the Stevens.

Mr. WOODWARD. The Navy gets the eight-ninths, and the Standard one-ninth in the shallow oil zone. The Navy gets 80 percent in the Stevens, and the Standard Oil Co. gets 20 percent.

Very briefly, the shallow oil zone at Elk Hills consists of a series of oil and gas sands, found between the depths of approximately 2,000 feet to 3,500 feet.

While I am going to summarize briefly this rather voluminous report, I would like to say that the engineering committee concluded after very careful study and continuous study for many years that there actually is an underground waste of oil occurring at Elk Hills at the present time. As best we can estimate, that is in the order of magnitude of more than 5,000 barrels a day of actual irrecoverable loss. This generally is caused by water trouble, where we find water under high pressure to the north of the field, and low-pressure water to the south of the field.

There are other contributary causes, one of which is severe faulting that was found in the field, where fluids can migrate between different sands in the shallow oil zone.

Another factor is the mechanical condition of some of the older wells, which have been drilled almost 30 years ago, which in accordance with today's standards are not good completion practices, but which presumably were in those days.

Mr. Smart has reviewed the history of Elk Hills quite well. I have some charts which I would like to show to the committee for its review.

The outline of Naval Petroleum Reserve No. 1 is shown on this first chart by the heavy black line. It is the area set aside by President Taft in 1912, the red line on the map represents the opinion of the Engineering Committee as to the productive limits of the field as of November 20, 1942.

In 1919 oil was discovered in what is called the Hay-Carman area. It was discovered on private lands, and was produced. A year later, in 1920, oil was discovered in section 36–S as shown by this other green-shaded area. In this eastern portion of the field it was very productive and development was very rapid. Shortly thereafter the Government leased offset lands to protect itself from drainage. The G, incidentally, on the map, indicates Government lands in this area.

During the period from 1920 to 1941, 156 million barrels were produced. At the end of 1951, the field was producing at a rate of 12,000 barrels per day from approximately 240 wells capable of production at that time. I am just going to hurry through these charts.

Incidentally our estimate of the ultimate recovery of shallow oil zone is 550 million barrels.

Mr. CUNNINGHAM. May I ask a question?

The CHAIRMAN. Mr. Cunningham.

Mr. CUNNINGHAM. Does each square represent 640 acres?

Mr. WOODWARD. Yes, sir.

Mr. COLE. What was the ultimate recovery?

Mr. WOODWARD. 550 million barrels of recovery, out of which we have produced roughly 210 million barrels, leaving a reserve of approximately 350 million barrels.

Mr. VINSON. The shallow zone has quite a bit left, then?

Mr. WOODWARD. It is around 60 percent. We have produced approximately 40 percent.

The period shown by the next chart is essentially the war production period, or the period of the unit plan contract, which covers 1942, through August 1945. The areal extent of the reserve was extended, in 1942 to cover certain adjacent lands. Again, the green areas shown on the second chart represent the area developed through 1941. The blue area represents the development during the war, and was carried on under the unit plan contract.

During the period 1942 to August 1945, some 30 million barrels were produced for the war effort, making a total recovery through August of 1945 of 188 million barrels.

The development was such that a productive capacity of 65,000 barrels per day was reached at the end of the war. That was accomplished by drilling some 385 additional wells.

Now, that is all I am going to say about the history. The Engineering Committee had considerable additional data which was made available through the wartime development. However, in the southern portion of the field, you will notice there was very little development. It was not developed for the reason that wells toward the crest of the structure, in the eastern portion of Elk Hills, were of low productivity. We were interested in getting wells of high productivity to get more barrels per day. For that reason in 1945 we had very little knowledge of the south flank, which is most important to us today. While we did have indications of movement of oil to the south, as early as 1946, we still had no confirmation of it. The fact that oil is moving off the reserve, or off the field, is a rather startling thing. It is not the common practice in the industry, and we questioned our data, which were limited, as we knew.

In 1951, and early in 1952, we embarked on a development program in the south flank at which time we received pressure and production data which confirmed our fears that the migration could be going on.

The additional information that has come to light recently has convinced the Engineering Committee that we have adverse migration.

The main trouble is water. To the north edge of the field we have very high-pressure water. To the south we have low-pressure water. This is a rather unusual condition. The fact you might have high-pressure waters is not startling. If you can get a good efficient water drive in the field, fine and dandy.

We made a number of theoretical calculations from core data, which led us to believe that recovery by water drive was an inefficient producing mechanism at Elk Hills. We were concerned about confirmation of our theoretical calculations, and therefore ran a field test to definitely determine water drive efficiency. The field is highly faulted, allowing us to pick an area for test. This area was in sections 26–S, 34–S, and 35–S, where we had a competent fault block, as shown on the next chart, which would enable us to conduct a field test to determine whether or not we should permit water to encroach.

That is just about in this area [indicating], and the next chart will show you that.

Mr. BATES. Mr. Chairman?

The CHAIRMAN. Mr. Bates.

Mr. BATES. You said this oil in the southern area migrated?

Mr. WOODWARD. Yes, sir.

Mr. BATES. Who owns that adjacent property?

Mr. WOODWARD. Private owners. The Standard Oil Co. owns some lands, there are other oil companies, too.

Mr. BATES. Is there production in that area?

Mr. WOODWARD. This is not productive here, the oil production is between these red lines, and below that it is water.

What has happened actually in this red line is tending to move south, where oil is migrating into water sands to the south. In the north, water is shoving this line to the south. The whole field is tending to move south.

Mr. GAVIN. As the water shoves the oil farther south, is there increasing production in the southern section you are speaking of?

Mr. WOODWARD. To be honest with you, sir, we have not produced the wells enough to give an intelligent answer to that. The wells have been drilled and produced just for test purposes, for a matter of days or a month, perhaps. The object is to keep the oil in the ground.

The CHAIRMAN. Mr. Johnson.

Mr. JOHNSON. Was the stepup during the war period of 65,000 barrels a day; is that what developed this intrusion of water there?

Mr. WOODWARD. Not wholly; it helped.

Mr. JOHNSON. In other words, that was an uneconomic way to operate the wells, and it wouldn't have been that way if you hadn't had the water; is that correct?

Mr. WOODWARD. That is only partially true, sir. It did upset the field. At the end of that time, we tried to restore the field to a maximum state of capacity production.

Mr. JOHNSON. Who has determination as to the general rate at which you are going to take your oil out of the ground?

Mr. WOODWARD. The Secretary of the Navy, or the Congress, I believe.

Mr. VINSON. The Secretary of the Navy. And Congress will pass a resolution.

Mr. JOHNSON. In other words, it was changed during the wartime very materially from the way it had been operated before?

Mr. WOODWARD. Yes, sir. We needed the oil, and we had to do that through additional development; by drilling 385 wells we were able to increase the production rate up to 65,000 barrels a day.

Mr. JOHNSON. In the studies you and your firm made, as brought out before, can you give us any idea how accurate do you think your estimates are?

Mr. WOODWARD. You are talking now about the reserve estimates or the availability?

Mr. JOHNSON. How accurate are your estimates of the possible reduction of oil? It is a little better than a guess; isn't it; it is based on geological data and principles, and so forth?

Mr. WOODWARD. That is right. More particularly, petroleum engineering principles are involved. It is the best estimate we can make. I believe if anything those estimates are conservative, but it is large enough to worry our committee.

Mr. WINSTEAD. Mr. Chairman.

The CHAIRMAN. Mr. Winstead.

Mr. WINSTEAD. If you step up the production, if you step it up wouldn't it have that tendency?

Mr. WOODWARD. No, sir. I tried to point out the increased production during the war period was only partially responsible. I have what I think is a reasonable answer—not an answer to the problem, but I think we have a reasonable explanation of what causes this thing: It is a bit involved.

Generally, it is the result of a regional study. We have high pressures over the northern portion of this large area and low pressure many miles to the south. This could be a result of faulting in the aquifer, or by production from many fields miles away. The fact remains you do have low pressures here in the south and high pressures here in the north, so what you do at Elk Hills here [indicating] has some effect, but relatively small effect. It is just nature that is doing this sort of thing.

In other words, water is trying to get from the north of the field to the south. Some of it is coming around the eastern nose [indicating]. The sands probably are not continuous enough to the east to let the waters come through readily.

Mr. WINSTEAD. In other words, if you step it up, that will assist it?

Mr. WOODWARD. Yes, sir.

Mr. GAVIN. May I ask the gentlemen now what the daily production is now in that tract?

Mr. WOODWARD. The daily production from the shallow oil zone is now about 7,500 barrels a day as I recall.

Mr. GAVIN. How many wells?

Mr. WOODWARD. There are something like 680 wells capable of production.

Mr. GAVIN. That is quite a drop of 12,000 production, down to 6,000 a day; isn't that right?

Mr. WOODWARD. We dropped it from 65,000.

Mr. GAVIN. Oh; from 65,000 down to 12,000?

Mr. WOODWARD. Actually, the production has been increasing for the last 6 years, in spite of what we can do to stop it. That is because of this water entering in through here, and causing loss.

In order to protect this area, we have to produce the wells that are producing substantial quantities of water.

Mr. GAVIN. You had 65,000 daily production; is that right?

Mr. WOODWARD. Yes, sir.

Mr. GAVIN. Today you have about 12,000?

Mr. WOODWARD. It averaged from 1952 approximately 6,000, or 6,500.

Mr. GAVIN. That has gone down rapidly, then, hasn't it?

Mr. WOODWARD. We substantially shut the field in.

Mr. GAVIN. You have shut the field in?

Mr. WOODWARD. Yes, sir.

Mr. VINSON. When you shut the field in, you shut it in on the engineering advice of the committee?

Mr. WOODWARD. We shut in at the direction of the Secretary, and produced at the minimum possible rate.

Mr. VINSON. But you advised him it would be practical to shut the field in?

Mr. WOODWARD. Yes, sir.

Mr. VINSON. Actually, it was your recommendation?

Mr. WOODWARD. Yes, sir.

Mr. VINSON. All the engineering committee agreed to that; did they?

Mr. WOODWARD. There were objections. I would have to explain a bit. The Secretary put a ceiling of 7,950 barrels a day for the shallow zone, as an absolute limit. In spite of that, we kept the production down to an absolute minimum. Of course, we had arguments in the committee one way or another, not necessarily Standard always wanting it up and the Navy wanting it down, but of course that was the general argument; we kept the production down to a minimum amount. In one case there was a written objection by the Standard Oil Co. on the length of test, I believe. This concerned what we call the rotating production-test program. I think that was the only written objection.

Mr. VINSON. But the Secretary had what you might say was the unanimous decision of the engineering committee, as to the number of barrels to be daily drawn out.

Mr. WOODWARD. I think that is correct.

Mr. VINSON. When did you decide, and when was it first called to your attention, that this seepage or migration was taking place?

When did you decide to shut it down from 15,000 barrels down to approximately 6,200 barrels? When did your Engineering Committee restudy the matter and find out probably you were losing oil by doing so, and that you should continue to pump more than the 6,000 barrels?

Mr. WOODWARD. Well, with reference to the south block, the Engineering Committee, I would say, late in 1946 and in 1947 had pressure data which indicated migration to the south. Our data were too few to conclude positively that that was happening. We had no information, for example, along—near the oil-water contact.

In 1948, in January of 1948, there was a hearing conducted by one of the Secretaries of the Interior, an Under Secretary, on the extension

of the boundaries of the reserve. At that time there was a Mr. Max Eastman, who was a Navy member of the Engineering Committee, and Navy member of the Operating Committee, who expressed the view that oil was migrating off of the structure. So that while the Engineering Committee had the fear that oil was migrating in 1946 and 1947, definitely by 1948 there was testimony to the effect that it was actually moving. We still didn't trust that information until we had information on the south flank.

For example, there might have been faults down there which would stop it.

Mr. VINSON. Mr. Woodward, did you advise the Secretary of the last administration—who was the Secretary at that time?

Mr. SMART. Mr. Whitehair was the Under Secretary, and Mr. Kimball was the Secretary.

Mr. VINSON. Did you advise Mr. Whitehair as to the letter he wrote the committee back in August as to the increase of barrels to be taken out?

Mr. WOODWARD. My understanding is Captain Meade's office advised Mr. Whitehair on the advice of the Engineering Committee of which I was a member. In addition, Captain Meade requested the opinion of DeGolyer and MacNaughton if it were proper. We advised Captain Meade, I believe it was about last June, to the effect that in our opinion it was proper to take the remedial measures.

Mr. VINSON. Did you also suggest the number of barrels it would be increased, as set out in the Secretary's letter, which was approximately 24,000 in addition to what you were drawing out now?

And the other day somebody has advised Captain Meade that the amount of barrels to be drawn out is 18,000, so that there has been a saving since the Secretary's letter down to this hearing date of 6,500 barrels a day?

Mr. WOODWARD. May I answer the latter part of you question? The difference between the 24,000 and the 18,100 is primarily caused by the work that the Engineering Committee is doing in the SS–2 and M sands in the center of the field, or toward the western portion of the productive part of the shallow oil zone. There is no program recommended as yet in this formal report. The additional increase, if any, is left blank.

The Engineering Committee has field tests underway at the present time to find productivity of the wells, to get additional information, and subsequently will make a recommendation.

Mr. VINSON. Just so the layman of ordinary intelligence can understand it: The Secretary wrote a letter to me as chairman of the Armed Services Committee back in August that he wanted to increase production in the amount of 24,000 barrels daily.

Now, you engineers and experts had advised him along that line, had you not?

Mr. WOODWARD. Yes, sir.

Mr. VINSON. So he was following your recommendations?

Mr. WOODWARD. Yes, sir.

Mr. VINSON. You are the ones we look to; is that correct?

Mr. WOODWARD. That is right.

Mr. VINSON. We have confidence in you, and in the ability of the firm you are associated with.

So last August you told us you needed the increase of 24,000 barrels to protect it.

Here in February, the end of the month, you come in and tell us that you need 18,000 barrels to protect it, so we have saved, I repeat again, 6,500 barrels a day by this hearing; haven't we?

Mr. WOODWARD. Your arithmetic is correct, sir; yes, sir.

Mr. VINSON. Is my arithmetic correct?

Mr. WOODWARD. Your arithmetic is correct.

Mr. VINSON. That is what happened then, isn't it?

Mr. COLE. I want to know what Secretary Whitehair said.

Mr. VINSON. He said exactly what I said.

Mr. COLE. Did he say increase it by 24,000, or increase it to 24,000?

Mr. SMART. Net increase of approximately 24,500.

Mr. WOODWARD. Mr. Vinson, may I answer you?

Mr. VINSON. I know these figures by heart. Here it is: let's get it straight again. Give me that letter, Mr. Smart, please.

Mr. COLE. The chairman is the only one who saw that letter.

Mr. VINSON. I will state to him, Mr. Smart and Mr. Kilday held a hearing on it, and I wrote a letter and said I wanted to put it before this new committee, and Mr. Cole. I am glad to note this, I am glad to note now, that the new Secretary is not adopting, in toto, everything that the previous Secretary had approved and done. So it is a little encouraging to know the new Secretary is looking over these things, like Mr. Wilson is looking them over, and holding everything up for study.

Mr. WOODWARD. I would like to clear up something.

Mr. PRICE. Did the chairman say Mr. Wilson was delaying the works?

Mr. VINSON. Here is what was worrying me. Mr. Smart, you have the letter.

Mr. SMART. Mr. Chairman, let me point out, the Secretary pointed out four different phases, and gave you the total of an increase of each phase. They add up to a 24,500-barrel increase.

Mr. VINSON. That is right. The reason I had this put in the record is Mr. Smart sent it down to me, and I wrote Mr. Smart back and told him that I thought he should advise the Secretary not to do anything until the committee, or the new Congress, has a right to pass on it.

I said, "Let everything stand—of course you have the right to do everything you please, but my suggestion would be to lay it before the full committee."

Now, he laid it before the committee in August; on August 15 he wrote a letter to me, and said he wanted an increased production of 24,000 barrels a day; isn't that correct?

Mr. SMART. 24,500.

Mr. VINSON. And added to that a production of 6,200, made 30,700 barrels to be the total amount taken out.

Now, Captain Meade comes in this morning and tells us that on somebody's recommendation he wants an increase of 18,000 barrels a day in addition to what they are producing now, of 24,200. I repeat, then, as a result of this inquiry, we saved 6,500 barrels a day, and of course Standard has lost, because Standard would have gotten one-ninth of the 6,500 barrels.

Mr. WOODWARD. Mr. Vinson, may I respectfully refer you to page 3 of this formal report.

Mr. NORBLAD. Three of what?

Mr. WOODWARD. Page 3 of this large report.

Mr. VINSON. All I am doing, Mr. Woodward, is just going by what Mr. Whitehair wrote me.

Mr. WOODWARD. On that page, are listed four programs.

Mr. VINSON. That is right.

Mr. WOODWARD. Where the Engineering Committee recommends certain additional production.

On the north flank they recommend 9,700 barrels a day. On the south flank, SS–1 sand, they recommend 6,100, and in the 77–2G area 2,300, the total of which is 18,100. For the south flank, SS–2, and M sand, this area I just mentioned, there is a notation which says no estimate of increase because of uncertainty of behavior of wells and gas cap area. We have not put in the estimated additional increase which may or may not come up to 24,000 barrels.

Mr. VINSON. Mr. Whitehair had that information when he wrote this letter, did he not?

Mr. WOODWARD. He did.

Mr. VINSON. Exactly. All right.

Mr. WOODWARD. I have a chart that will go into the SS–2–M, but since that time there have been certain additional data come to light.

Mr. GAVIN. May I ask a question, Mr. Chairman?

The CHAIRMAN. Mr. Gavin.

Mr. GAVIN. You say the field is partly shut in now?

Mr. WOODWARD. It is very substantially shut in, sir.

Mr. GAVIN. Substantially shut in. You could increase your production up to 18,000 or 24,000 without any difficulty, without drilling any additional wells now, if you wanted to; couldn't you?

Mr. WOODWARD. Certainly. But it would not be the right thing to do.

Mr. GAVIN. Well, that may be, but you could bring up your production to 24,000 by turning a valve.

Mr. WOODWARD. Easily.

Mr. GAVIN. Now, let me ask you: You say infiltration of water in this field, in certain portions of it. Can you arrive at satisfactory conclusions with these wells shut in that the seepage of water is effecting the field?

Mr. WOODWARD. Yes, sir; we test the wells from time to time.

Mr. GAVIN. What?

Mr. WOODWARD. We test the wells in the field from time to time. The information which in part we get out of the production of roughly 6,000 or 7,000 barrels a day we are obtaining from Elk Hills shallow zone today has led us to conclude this water is causing us trouble. Of course we use all the data we have.

Mr. GAVIN. If the wells were permitted to produce, you could arrive at a better conclusion as to how badly the water seepage or infiltration was affecting the field; couldn't you?

Mr. WOODWARD. Yes, sir.

Mr. GAVIN. Is it going to be satisfactory, then, to arrive at your conclusions, which you have now, without actually testing, if all the wells were opened, as to how badly the water was affecting the field?

Mr. WOODWARD. It is the best answer we can give now. We of course will watch all of our programs very carefully; and as pressure changes, as production data becomes available, indicating changes, those changes will be made.

I would like to make one point clear about the drilling of these 36 wells, or actually 39 wells: We are not drilling that merely to get oil production. We propose to drill those wells along the north flank in the east nose to prevent this water from coming in, to prevent it from damaging the oil sands. It is not for the purpose of producing oil. It is to save the major portion of the reservoir.

Mr. GAVIN. Are you drilling any wells in the south section of the portion?

Mr. WOODWARD. We haven't proposed any additional development down here. This south flank is not completely developed yet, though.

Mr. HARDY. The thing to be would be to stop the intrusion of the water, rather than produce oil.

Mr. WOODWARD. That is perfectly right.

Mr. COLE. Is that the sole measure necessary: to drill wells in order to relieve the pressure, to keep the water from coming down? Why isn't it necessary to increase the production from the other wells?

Mr. WOODWARD. We have several problems. Take the north flank. We have to take care of the water coming in. That is one problem. If we can take out as much as is coming in, we are not going to damage the top portion of the reservoir. We have to be very careful with that, however, because we have a number of separate sands. The problem is not quite as easy as it sounds.

We intend to increase production of the wells along the north flank. Unfortunately, that makes more oil production. With the increased production of wells we have now, with the putting on production of wells which are now shut in, it is still not sufficient to withdraw this total influx of water in the field.

For that reason, we have to spot additional wells down here in strategic locations to prevent the water migration into oil sands.

Mr. GAVIN. You can't prevent the water coming in. What you will do is increase the production on the wells you have now to take off the oil; is that right?

Mr. WOODWARD. We are going to take the water out if it comes in.

Mr. JOHNSON. Is that what it is; you take the water away?

Mr. WOODWARD. That is right.

Mr. JOHNSON. The more you take away, the less pressure you have.

Mr. WOODWARD. That is right.

Mr. COLE. What if you drilled 100 wells instead of 39? Would you nevertheless have to increase production from the other wells?

Mr. WOODWARD. We wouldn't increase total production by drilling 100 wells any more than by drilling 36 wells. It is the volume of fluid we are trying to take out.

Now, to answer the other part, I believe, to Mr. Cole's question: It is the reverse situation down here in the south flank, where oil is migrating down here. What we are actually trying to do is to prevent loss of ultimate recovery by catching that oil before it is irrecoverably lost.

Mr. HESS. Would the migration relieve the oil pressure?

Mr. WOODWARD. We want to keep our datum pressures level.

Mr. HESS. If you take the oil out of the north flank, would the oil on the south flank be available?

Mr. WOODWARD. No, sir.

Mr. HESS. I asked you about that.

Mr. WOODWARD. I was thinking of the north flank. The reason the oil will continue to migrate on the south flank is that you have pressures on the north of roughly 800 pounds higher than you do on the south. That follows throughout the field, below the field, into the aquifer; again, that is the water-bearing sand. In that area the pressures are even lower. So, you have a pressure differential in the field, from the south flank down into—from the crestal area, and the south flank, into the water. The pressure is greater, which means that fluid will move, and that means oil is going to have to move here.

Mr. HESS. That pressure differential will be true even if it happens on the north flank, to relieve the water pressure?

Mr. WOODWARD. That is right. This water problem is, as I say, the main cause of the worry of the Engineering Committee. We conducted a field experiment, which is most important. I have the results to show you if we have time, sir.

Mr. BENNETT. One question, following on what he said:

Despite the fact you talked previously in this conversation about the migration of the oil out of the field, the program that you are presenting here today has nothing to do with the migration of oil out of the field at all; does it? It has only to do with the immigration of the water into the field?

Mr. WOODWARD. That is all we have, so far.

The CHAIRMAN. I think perhaps this would be a good place to adjourn this morning. We will continue the hearing tomorrow morning.

I trust the members of the committee will be over on the floor. We are going to call up the Davis amendment.

Pursuant to House Resolution 125, passed by the House yesterday, February 24, I am appointing Subcommittee No. 1 to make a study and inquire into the current status of the Government-owned synthetic-rubber plants at Akron, Ohio, and to further compare the present synthetic-rubber process of the Government with any new developments in synthetic rubber in private industry, insofar as that may be possible.

In order to make this study, it will be necessary for the subcommittee to go to Akron, Ohio, and the present plan is for the group to leave here on Friday night of this week, returning to Washington on Monday morning.

Tomorrow morning at 10 o'clock the committee will resume its hearing. At that time we will hear Mr. Floyd Bryant, the vice president of Standard Oil of California, and Mr. John Thatcher, his assistant.

We will give Mr. Woodward an opportunity to be heard further tomorrow.

(Whereupon, at 11:45 a. m., the committee recessed to reconvene at 10 a. m. Thursday, February 26, 1953.)

NAVAL PETROLEUM RESERVES

THURSDAY, FEBRUARY 26, 1953

HOUSE OF REPRESENTATIVES,
COMMITTEE ON ARMED SERVICES,
Washington, D. C.

(The committee met at 10 a. m., the Honorable Dewey Short, chairman of the committee, presiding.)

The CHAIRMAN. The committee will be in order.

We will resume hearings on the Naval Petroleum Reserve No. 1, known as Elk Hills, a California project.

Mr. Woodward, I think you were testifying when we recessed yesterday and no doubt some of the members will want to ask you a few questions.

However, if you have anything in addition to say this morning or anything to clarify or emphasize, we would be glad to hear you.

STATEMENT OF G. E. WOODWARD, VICE PRESIDENT, DeGOLYLER & MacNAUGHTON—Resumed

Mr. WOODWARD. Thank you, sir.

There is additional information I would like to give the committee by running through the charts that have been prepared. I think it would be of help.

First, however, at your pleasure I would like to have introduced this letter that has been prepared by Mr. MacNaughton. I believe each of you has a copy. If you would care to have it read or just put in, it is immaterial to me.

The CHAIRMAN. Yes. I think it is in the record, or we will include it at this time or this point, if the stenographer doesn't already have it.

Oh, it is not long, though. You might read it to the committee. We will be sure then they will know what is in it.

Mr. WOODWARD. This is a letter dated February 9, 1953, addressed to Captain R. H. Meade, Director of Naval Petroleum Reserves. It says:

DEAR SIR: You have requested my opinion of the proposed change in production policy at Elk Hills, Naval Petroleum Reserve No. 1, and in particular with the recommendations of the Engineering Committee in their report which is now under preparation.

As a result of the studies made by the Engineering Committee which I hav reviewed, I am convinced that the shallow zone at Elk Hills will continue to diminish in reserves and productive capacity with time, regardless of any preventive measures that may be attempted. This situation will continue because of unstable pressure distribution within the oil field and in areas immediately adjacent thereto.

I know of no other oil field where problems exist as do at Elk Hills. The shallow zone is approximately 40 percent depleted at the present time. Nonuniform production of the oil within the field to date, and, what is much more important, the large pressure in the aquifer north of the field coupled with the

low pressure in the aquifer south of the field has made a pressure unbalance within and without the oil field. The result of this is that water encroaches from the north and east and oil encroaches into water sands to the south. This phenomenon is well established by factual evidence. There appears to be no hope of correcting this situation within the foreseeable future.

In addition to the potential actual loss of oil by virtue of the underground movement of water, I feel that it is wise that production be withdrawn from the field for test purposes. This involves the production of wells which produce substantial quantities of water and of other wells which have shown essentially no water production, the latter in order to determine productivity and mechanical conditions in wells. Thus, production is sesential from the field for these two basic reasons; one for protection from underground waste and the other for a continuing determination of productive capacity and well conditions.

It has been found that the necessary production has increased from approximately 5,000 barrels per day for the period from January 1948 to January 1951 to over 6,000 barrels per day at the present time. It appears that even this amount of production has been insufficient to prevent loss of ultimate recovery.

Precise estimates of the amount of production which is necessary to prevent loss of ultimate recovery will have to be determined by data developed in the future after a determined effort has been made to prevent loss through production under a policy such as is now under consideration.

The availability of production from Elk Hills is related to recoverable reserves. Since oil must be produced in ever-increasing amounts to protect the reserves, productive capacity therefore will continue to decrease, thus decreasing the effectiveness of the shallow zone of Elk Hills as an emergency source of production. It is also believed that if no production were taken out of Elk Hills, especially on the south flank, availability would still continue to decrease although at a lesser rate than if production were taken. This likewise would be at the expense of ultimate recovery. In my opinion, the loss of ultimate recovery is out of proportion to any saving in loss of availability.

I therefore concur with the policy that additional production should be obtained from Elk Hills in order to assure the maximum economic ultimate recovery even at the expense of additional loss of availability. It must be recognized that the shallow oil zone is not a reserve which is well suited for the purpose intended since the crude oil therein may not be safely stockpiled.

Submitted.

LEWIS W. MACNAUGHTON.

Now if I may——

The CHAIRMAN. Any questions on the letter before he proceeds?

Mr. COLE. Mr. Chairman, what is meant when he uses the expression "even at the expense of additional loss of availability?"

Mr. WOODWARD. As you produce oil from Elk Hills, availability will decrease. There is not as much oil left.

In one case, if you produce oil, as under our suggested program, we are going to prevent loss of ultimate recovery or loss of reserves, actual barrels of oil. So we have to compare the barrels of oil we save against the availability for emergency production.

It seems out of proportion to save or to waste many thousands of barrels, to save 1 barrel a day of productive capacity. That is the thought that I am sure Mr. MacNaughton has in mind.

Mr. COLE. There is one other question. In his letter he says, he approves of this proposal, "in order to assure the maximum economic ultimate recovery." Now is there any conflict between a goal of maximum ultimate recovery and a goal of conservation?

Mr. WOODWARD. No.

I assume you are not now referring to availability.

Mr. COLE. No.

Mr. WOODWARD. We want to get the maximum amount of oil out of the field. That is conservation. And Mr. MacNaughton prefers to get the maximum amount of oil because by so doing you are better

off even though at the same time you sacrifice a small amount of availability.

Mr. COLE. You see, there is a conflict.

Mr. WOODWARD. Yes.

Mr. COLE. Of thinking?

Mr. WOODWARD. Very definitely.

Mr. COLE. On the one hand, our goal is to conserve it.

Mr. WOODWARD. Yes, sir.

Mr. COLE. Which means to keep it.

Mr. WOODWARD. That is right.

Mr. COLE. And not take any of it out?

Mr. WOODWARD. That is correct.

Mr. COLE. Now, is this objective Mr. MacNaughton has indicated of the maximum economic ultimate recovery—is that in your opinion and in his completely consistent with the purpose or the objective of retention, conservation, and preservation of the oil?

Mr. WOODWARD. Yes; it is.

Mr. WICKERSHAM. I want to ask a question, Mr. Chairman. Is your firm the consultant also for the Alaska project?

Mr. WOODWARD. Yes.

Mr. WICKERSHAM. And the other Navy projects?

Mr. WOODWARD. Yes.

Mr. WICKERSHAM. Teapot Dome and the others?

Mr. WOODWARD. Yes. It is my understanding that those subjects will be taken up a little later.

While I am generally familiar with those other reserves, we have another man who is thoroughly familiar with them.

The CHAIRMAN. Proceed.

Mr. WOODWARD. We got to the point yesterday of the situation in the oilfield as of August 1945. At or about that time, at the instance of the Navy, a program was set up to keep the field in a condition of maximum readiness and also to try to obtain maximum economic recovery. The Engineering Committee in order to accomplish these objectives set up eight different programs which were designed to do that. They were also designed to get additional information under which we could operate the field to the best advantage.

Those programs that appear in the formal report were a gas injection program, in order to increase productivity. We took an area we called the major water encroachment, which is most important, and I will dwell on that in a few moments; a minor water encroachment, which I will not bother you with; a dewatering project, where we were studying gravity drainage; another program called the rotating test production, where once a year we would test each well in the field not otherwise tested to determine productivity mechanical conditions in wells; another program of protective production of wet wells designed to prevent contamination of sands by water; we had a remedial program where we repaired wells which were in bad mechanical condition; and last, a program of protection of surface equipment which essentially was a mothballing program.

The major water encroachment area is shown on this chart and happens to be the same as map 1 in our formal report. If you

gentlemen sometime care to refer to it, it is about in the middle of that formal report.

The major water encroachment is an area located in the north flank of the field, at approximately the center of the productive area. It was selected by the Engineering Committee because it seemed to be as representative an area as we could get and furthermore, it was an area sealed off by faulting and we could study that particular area. For many years, production had been obtained from this fault block, and from this general area.

We first made theoretical studies which led us to believe that recovery by water drive would not be efficient. In spite of those studies, we wanted to make a full field test and we picked this area.

We therefore shut in the wells that had been producing a lot of water, in the hopes that we would shove oil up to the top of the structure. We could recover it there just as easily and get the advantage of the water drive.

This chart shows a blowup of this fault block, where we shut in the wells down the structure. The first line shows the edge water. That is defined here as being an area where a well would make 33 percent water and 67 percent oil. Water encroached from 1940 to 1945 only a very short distance because of the production downstructure. After shutting in the wells, water rapidly went upstructure. Further up in this fault block we were watching wells as closely as we could. The first thing we noticed was the well upstructure became wet, that it began to produce water while wells below it were still clean, indicating to us that water was going up a permeable finger of sand or it was going up the fault plane. In order to check that, we went back in the watered-out area and drilled a well, which happened to be "77–27S." There were several fingers or lenses of sand there which we tested individually. We had all sorts of results. Some of the fingers showed absolutely clean oil, or with essentially no water production. There were two or three fingers that did that. In one finger which we originally thought to be oil-productive was wet on test. This well is today producing 5 percent water while surrounding wells are wet, production being at the order of magnitude 90 percent water.

That means that behind this water front there was an area where oil was bypassed. Hence we are losing the availability of that oil and undoubtedly reserves. We can conclude then that this is another reason that the advancement of water from the north is very bad.

For some time wells downstructure, had been making water. In 1945 those wells were producing 1,000 barrels per day of oil and approximately 5,500 barrels per day of water. After shutting in for 3 years, or say two years and a half, we put the wells back on production to try to de-water the area. When we put them on, they made even less than 400 barrels per day. But the same comparable wells today are making 400 barrels a day of oil and essentially the same amount of water. So we have lost something like 600 barrels per day of availability, and that concerns us.

Now, this present rate of 400 barrels of oil per day is increasing, with time, at least it has increased in the past. But it demonstrated to us rather clearly that you would lose availability and undoubtedly reserves by allowing water to come in.

This situation of the high water as I have mentioned before continues well along the north flank and the east nose of the field. What the

Engineering Committee proposes to do about it is to produce that fluid as it comes in. We propose to put wells on production that are there and are available to be put on production, and to increase production of wells that are now in production. Our calculations indicate that even putting those wells on production is insufficient to take care of the entire influx of water. We need more spigots, in effect, to take that water out. Our calculations indicate that we will need 36 more wells along the north flank and east nose to take care of that water influx. That is the reason we are recommending 36 wells, not for the purpose of producing a bunch of oil but to keep from damaging these upstructure sands.

Mr. VINSON. Mr. Chairman, may I ask?

The CHAIRMAN. Mr. Vinson.

Mr. VINSON. Which area in the shallow zone was that referred to in the Secretary's letter? Was it No. 1, No. 2, or No. 3?

Mr. WOODWARD. I don't happen to have it. It has to do with the north flank.

Mr. VINSON. Is 6,500 barrels what you will draw out of that?

Mr. WOODWARD. I would guess it is No. 4, sir.

Mr. VINSON. No. 4, now how many wells will you drill there?

Mr. WOODWARD. I beg pardon, sir?

Mr. VINSON. How many wells will you drill there?

Mr. WOODWARD. Approximately 36.

Mr. VINSON. Thirty-six? And then in No. 1, referred to as 77–2G area of the SS–2 sand. You have three new wells there?

Mr. WOODWARD. Yes.

Mr. VINSON. And that makes your 39 wells?

Mr. WOODWARD. Yes. The 77–2G area is around the east nose of the field. It is a separate little problem, very closely related to the north flank, however.

The next chart shows essentially an "SS–2 and M" sand condition, being a simplified or diagrammatic section through the western portion of the productive area of the shallow oil zone.

In 1945 we knew we had high pressures on the north. The right-hand portion of the chart representing the area to the north part of the field. We knew we had high pressures there. We were producing wells up there which were making water. The idea there was to keep water from encroaching, since we know that is detrimental.

Now, this represents the pressure distribution, this red line.

Since the pressures are higher on the north, fluids tend to migrate in accordance with this pressure curve. Even though oil and water come upstructure or uphill, the pressures are such that they would make them come uphill.

Now, what we would like to do would be to flatten that entire pressure curve so we would have no movement of fluids in reservoir. One way of trying to do that was by this gas injection project to which I referred. Our idea there was to inject gas so we would no longer have to produce the oil and water on the north flank. That was the condition in 1945.

Injecting gas in the gas cap to stop this migration from the north also, of course, increases pressures to the south.

Now on our maps at that time, and still are, there was faulting indicated on the southern portion of the field and certainly our hope was that that faulting would be such to prevent any migration in that direction.

However, those faults are not competent, as we say. They are not pressure-tight. Fluids can move past those faults. So the result was, after injection of gas, our pressures increased. Our pressures are still high in the north and we are increasing pressures to the south. So we have actually forced a pressure gradient in this manner, [indicating] and the effect is oil is moved downstructure. This is of course just pressure data. We have production data from wells down here to the south. These wells originally made a little bit of water increased after a period of time as one would expect. After injecting gas the water percentage decreased, indicating oil was going down. Of course, the only thing that can cause that is that pressure differential.

Now, what we still propose to do is to try to flatten that pressure gradient out. We intend to do that by withdrawing fluids upstructure, gas and oil. What we want to do of course is only flatten out that pressure gradient. It is going to take production of gas and oil to stop that. Again we are still faced with this high pressure up here. We can only stop that with additional production on the north flank. The two projects, in fact all projects, are related.

One point I would like to make. Pressures in here [indicating], on the south flank, in the SS2 and M sands, have not decreased. As a matter of fact they have increased. It is different than the other sands in the south flank. But the thing that makes movement is the pressure gradient and we definitely have a pressure gradient. As a result of the injection, not only have pressures increased but the gradient has also, well if not increased—it may have increased slightly but the gradient still exists so the oil can move down structure into these water sands which will cause loss.

Mr. NELSON. Mr. Chairman.

The CHAIRMAN. Mr. Nelson.

Mr. NELSON. When the water comes in from the north where you show it is high pressure, does it mingle with the oil or does it push the oil south of it?

Mr. WOODWARD. Unfortunately, when the water comes in, it does not move in an even front. There are several—that is the sand is not uniform. It has a permeable streak and water will tend to move on up that streak. There is oil in streaks left behind. Water will tend to go up those as well but not as fast. So you get an intermingling of water up structure.

If you recall that chart on the major water encroachment, where we drilled a well behind the waterfront. That showed us definitely that oil was left behind, because the water prefers to move up the easier path, the ones of the highest permeability.

Mr. NELSON. Well, when water does move up a single path, where there is oil, does it push the oil out?

Mr. WOODWARD. Yes.

Mr. NELSON. It doesn't mingle with the oil?

Mr. WOODWARD. That is right.

Mr. NELSON. You said the oil is migrating south. When that oil goes into the water sands, does it push the water out?

Mr. WOODWARD. Yes, and it also pushes it down in the same streaks. It is not an efficient push of water.

Mr. NELSON. So the mingling is in different strata?

Mr. WOODWARD. Right, in the same sand body.

Mr. VINSON. Mr. Chairman, may I ask a question?

The CHAIRMAN. Yes.

Mr. VINSON. Now in the splendid study that this group of engineers made, the Engineering Committee, have you determined in your mind the proper way to handle it is to increase production or are you trying to work out a proper conservation program?

Mr. WOODWARD. Well, as engineers, of course, we are trying to save the oil and we are perfectly aware of the availability problem. We are trying to protect the reserve so that we do not lose anything and still keep maximum availability.

Mr. VINSON. Well, now——

Mr. WOODWARD. The thing that worries the engineers is the loss of oil by movement of water from the north.

Mr. VINSON. Well, from your study now, is your mind drifting along a direct policy of increased production?

Mr. WOODWARD. That is right.

Mr. VINSON. Well, that is entirely in conflict with the concept of the whole legislation, which was conservation.

Mr. WOODWARD. At the same time, sir, if we do not produce this we are going to lose oil and we are going to lose availability and we get nothing for our work.

Mr. VINSON. May I read Mr. MacNaughton's letter again, a portion of it, Mr. Chairman?

The CHAIRMAN. Yes.

Mr. VINSON. He said this:

> The availability of production from Elk Hills is related to recoverable reserves. Since oil must be produced in ever-increasing amounts to protect the reserves, productive capacity therefore will continue to decrease, thus decreasing the effectiveness of the shallow zone of Elk Hills.

Now that simply means that to follow out your policy of conservation you must eat it up and by eating it up you are still carrying out your conservation program. You are drawing your oil out, but you do not have any reserve left after you draw it out.

Now the objective of Congress was to conserve the oil in the ground?

Mr. WOODWARD. Yes.

Mr. VINSON. Now I could not understand your statement when you said to Mr. Cole—you read this:

> I therefore concur with the policy that additional production should be obtained from Elk Hills in order to assure the maximum economic ultimate recovery even at the expense of additional loss of availability—

and you said that meant conservation. Then it runs through my mind that to conserve anything you eat it up.

Mr. WOODWARD. To leave all of the oil in the ground, we could first shut in the entire field. If we did that, without taking any production from the field, we would be losing oil every day. I think we are losing oil today.

The CHAIRMAN. If you do not eat it up, you will never get it.

Mr. WOODWARD. That is right, sir.

Mr. VINSON. Then we just as well announce that we are going to have a Belshazzar's Feast and go ahead and eat the whole thing up.

Now I want to compliment you because this is the first time I have ever seen such a magnificent study presented to the committee on the detailed matter. But it looks to me as if you gentlemen are working on the proper way to produce oil.

What we have been dealing with is the proper way to conserve oil.

Mr. WOODWARD. That is right. And by conserving it I do not mean no production.

Mr. VINSON. Well, we thought by conserving it that we would keep it in the ground and in a state of readiness.

Mr. WOODWARD. We have two slightly divergent commitments under the contract. One is to keep as much oil in the ground as possible and the other is to assure maximum recovery. If we could get by without producing a drop of oil in the field it would be fine if it would cause no damage.

Mr. VINSON. Do you subscribe to the philosophy that is behind the setting aside of these areas for oil reserves and do you believe in the principle of oil conservation in the ground, as announced by the Department and been followed for years from President Taft's time?

Mr. WOODWARD. I will say—that is a very complex subject of course, but I will say the production at the rate of 65,000 barrels of oil a day that Elk Hills provided during the last war was a godsend to relieve the shortages on the west coast.

Mr. VINSON. That is right.

Mr. WOODWARD. Unfortunately, I believe that the oil should have been developed earlier, instead of during the wartime, and had an even greater effect.

The shortage of oil there was really terrible in the latter portions of the war and this stockpile at that time was very fortunate.

Now, unfortunately, as time goes on, from a general geologic concept we are going to lose that type of reserve. It is not a good reserve. The Stevens zone is a beautiful reserve. It is in a virgin condition. That is different.

Mr. VINSON. Now, you referred to it correctly. I hope the committee can visualize it as a stockpile. And it met a very important need when we opened it up to 65,000 barrels, in the wartime; isn't that correct?

Mr. WOODWARD. That is right.

Mr. VINSON. But you got away from our original question:

Do you subscribe to that policy that has been established by the Congress and been followed ever since President Taft set it aside, that we should have a stockpile of oil in a naval reserve like Elk Hills, and Teapot Dome, and wherever we have it?

Now, you are here administering it. You are our adviser. We want to know if your heart is in production, or whether it is in conserving or conservation.

Mr. WOODWARD. I subscribe to a stockpiling of oil in a proper reservoir in limited amounts. I subscribe more fully to the dependence upon the oil industry to supply the emergency requirements.

Mr. VINSON. Well, in view of that statement, then you are not a very ardent supporter of the policy of conservation of the oil in the ground as announced by the setting aside of this reserve. Isn't that a correct summing up of your statement?

Mr. WOODWARD. No; I would say I am a very ardent supporter of trying to save the oil in the ground in the shallow zone.

Mr. VINSON. Yes; I understand that.

Mr. WOODWARD. In the Stevens zone.

Mr. VINSON. Yes; but when you are saving it, you are using it all up by this process of continuing to draw it out, because you have

opened up an avenue now by which in a period of time, which mathematically can be worked out, you will completely exhaust your stockpile. You are adding nothing to the stockpile. You are taking out from the stockpile. It is just a question of when you are going to get it all out.

Now, I wouldn't say that is a very determined conservation policy. Now, it may not be possible to have any conservation policy in reference to this oil.

Mr. WOODWARD. Sir, I again want to point out if we don't take the oil out of there, that is, the Navy and Standard in a unit operation, something else is going to take it out.

Mr. VINSON. All right. Then you have adopted a policy of increased current production to protect our interests; is that what it means——

Mr. WOODWARD. No.

Mr. VINSON. And not any conservation at all?

Mr. WOODWARD. No, sir; I'm adopting the policy of production to protect the oil we have in the ground, and in my opinion that is conservation. It is not conservation to let oil run down structure to water sands, and to let water run up structure into oil sands.

Mr. VINSON. Now, you raised a question. I want to read this for the record, for the benefit of the members of the committee, because at least out of this hearing I think we can tie something down. Now, I want to call your attention to this: It is a statement that was made in a very fine hearing that Mr. Smart conducted:

Now, with regard to the Stevens zone, you do visualize that as a proper place where conservation can be satisfactorily achieved?

Mr. WOODWARD. Yes, sir.

Mr. VINSON. All right. Now, this is in response to a question by Mr. Stolz:

> We might consider the Stevens zone at Elk Hills, which is a new field and which can be kept shut for 100 years, with probably not even the loss of a single barrel. The shallow zone is an old field which has been producing for 22 years under competitive operations.

Further:

> The Stevens zone is a virgin.

Now, then, the committee can understand that we got to increase this production to conserve the oil in shallow zone, but in Stevens zone there is no need to be alarmed by any seepage or any water and it should be conserved?

Mr. WOODWARD. It is perfectly right, sir. We have no concern at the present time at least on the Stevens zone, because we do not have those large pressure differentials that we have in the shallow zone.

Mr. VINSON. Now, tell the committee again how many barrels do you estimate in the Stevens zone? Of course, I know the Stevens zone couldn't cover the whole area, because it is a funnel-shaped area, and is not so large as the shallow zone.

How many acres do you estimate now is in the Stevens zone?

Mr. WOODWARD. Oh, I don't recall, offhand. I would give a guess—well, I would rather look it up and give you an accurate figure, better.

Mr. VINSON. All right.

Mr. WOODWARD. Now, on reserves, the engineering committee is considering the reserves in the Stevens zone. Because of fractured shale and chert reservoirs——

Mr. VINSON. Now, are you running into some trouble down in the Stevens zone?

Mr. WOODWARD. No, sir; only as far as our arithmetic is concerned.

Mr. VINSON. That would cause you to come in here and say we have to do this in the Stevens zone, to eat it up to save it?

Mr. WOODWARD. No, sir; absolutely not.

Mr. VINSON. What?

Mr. WOODWARD. Absolutely not.

Mr. VINSON. That is right.

Mr. WOODWARD. I believe the thought in your mind was how large was the Stevens zone in terms of barrels?

Mr. VINSON. That is right.

Mr. WOODWARD. And I was pointing out it is most difficult to estimate the reserves, because of our mechanical difficulties, that is, our own pencil and paper, to figure it out, because of a particular type of horizon which is not subject to normal methods of estimation of a reserve in the absence of production.

So it is going to be a rank estimate.

Mr. VINSON. All right.

Mr. WOODWARD. It is probably of the order of magnitude of 350 million barrels.

Mr. VINSON. How much?

Mr. WOODWARD. 350 million barrels, approximately the same as the shallow zone.

The CHAIRMAN. Yes, sir; approximately one-half the orignal amount in the shallow zone.

Mr. WOODWARD. Sir, I believe the original amount in the shallow zone is about 550 million barrels.

The CHAIRMAN. I thought it was 700.

Mr. WOODWARD. No; I think that is high.

Mr. VINSON. Then the committee can understand that the Stevens zone which has been classified as a virgin field—never been worked—notwithstanding the fact that the captain yesterday said there were about 180 wells drilled in it—that it has a capacity of about 350 million barrels?

Mr. WOODWARD. Those are the reserves, sir, roughly.

Mr. VINSON. The reserve. And you know of nothing that would cause us to have to go in there to draw it out to save it?

Mr. WOODWARD. That is correct.

Mr. VINSON. What?

Mr. WOODWARD. That is correct. The only kind of production that I would permit if it were in my authority to countenance would be very, very minor testing of wells occasionally to assure us that the conditions are all right; that our casing hasn't collapsed; that we don't have any other troubles in the wells—just to look at them once in a while.

Mr. VINSON. You stated yesterday the ratio. Give it again for the record. What is the ratio of ownership in the Stevens zone?

Mr. WOODWARD. The United States Government owns 80 percent, and the Standard Oil Co. 20 percent, approximately.

Mr. VINSON. What is the ratio of ownership in the shallow zone?

Mr. WOODWARD. The Federal Government owns two-thirds and the Standard Oil Co. one-third.

Mr. VINSON. Now—that is all. Thank you, Mr. Chairman.

The CHAIRMAN. Mr. Nelson.

Mr. NELSON. Mr. Woodward, as I understand the purpose of this program, it is to recover as much oil as possible before it is shoved off the reservation to the south; is that correct?

Mr. WOODWARD. Well, not exactly. We are still trying to keep as much in there as we can.

Mr. NELSON. Well, now, when this oil is shoved off to the south, is there still recovery?

Mr. WOODWARD. Approximately half of it. But you are going to lose the half. Now, I indicated yesterday an estimate of 5,000 barrels a day. However, there is more oil than that moving off the structure to the south, or being lost to the north, on the water encroachment. We think that, irrecoverably, an amount of oil will be lost of the order of magnitude of 5,000 barrels a day.

Mr. NELSON. Is that the oil that is being shoved off the reservation or oil that is being lost?

Mr. WOODWARD. That is oil that is being moved from the oil sands down into the water sands; in these fingers of sand.

Mr. NELSON. You say that is recoverable to some extent?

Mr. WOODWARD. A portion is recoverable, roughly half.

Mr. NELSON. You already told me when it moves into the water sands it shoves the water out.

Mr. WOODWARD. Unfortunately, the oil wets the sand grains—and we have to get a bit technical—and that oil, once it wets the sand grains, doesn't want to leave it. So you just can't wash oil into the water sand and then get it all back. You leave some on the sand grains.

Mr. NELSON. Has your committee given any consideration, as a conservation measure, of acquiring land to the south and producing oil from that land as it is shoved off the reservation?

Mr. WOODWARD. No; as a matter of fact, that is outside the province of the committee.

Mr. NELSON. Is it a possibility?

Mr. WOODWARD. Well, it is a possibility. What the committee would propose to do—we will have to pretend this is the SS–1 sand, where that condition exists. We have, again, our pressure gradient to the south this way: We propose to make a little reversal in that pressure gradient, or to withdraw this oil here before it gets into the water sand. In my opinion, that also is conservation because once it gets down into the water sand a sizable portion of that is irrecoverably lost.

Mr. NELSON. And that——

Mr. WOODWARD. Even though, Mr. Vinson, we are producing oil, I would like to point out that that is conservation because——

Mr. VINSON. Of course. Mr. Chairman, let me ask this one question for the record, please:

Now, in this conservation program that you now find absolutely necessary to draw an additional 18,000 barrels a day, how long do you anticipate that will stay around 18,000 barrels to protect the reserve? Do you anticipate you will have to further increase it to protect the reserve?

Mr. WOODWARD. I would have to consider some of our programs. On the north flank, north of the field, where we have this great ocean of water trying to shove our oil over the hill, I suggested that program will have to continue indefinitely.

In this particular SS–2 and M sand trouble we have, where we are trying to flatten out this pressure, we have reason to believe that we can cure this problem, that it is a temporary measure to withdraw fluids to flatten out the datum pressures. Now, how long that will be, I can't say. It will depend on the facts as we get them in time to come.

But we do have hopes of curing that.

On the SS–1 sand, where oil is migrating into the water sands, and we have this ocean that is receding away from us on the south, I suggest that is probably going to be a continuing operation.

Mr. VINSON. Well, there is no likelihood within the next 2 years you will be coming back here telling us that you will have to increase the daily production?

Mr. WOODWARD. I haven't any idea, sir. That will depend only on the facts as we develop them in the field.

Mr. VINSON. Wait one minute. You made all the development necessary today to justify your hanging your hat on 18,000 barrels?

Mr. WOODWARD. That 18,000-barrel figure——

Mr. VINSON. Or is this merely an experiment to see whether you can accomplish it?

Mr. WOODWARD. In arriving at that 18,000-barrel figure, which incidentally I think Captain Meade may want to explain a bit further, we have had to do such things as estimating production from 39 wells that haven't been drilled. We can make a reasonably intelligent estimate of that. But maybe the figure is going to be higher or lower. We don't know. We will have to wait until the wells are drilled, if they are drilled, to find out what is going to happen. We will have to watch the effect of the production along the north flank.

Perhaps it may be reduced. Perhaps it would have to be increased. But our object is to prevent water from damaging these sands. That is the only thing I care about. And that, again, sir; is conservation in my mind. On the south flank we are going to have to watch that, to assure ourselves as nearly as we can that we are not losing oil down there. And again, I suggest that is conservation. It is in accordance with that principle in the contract which says to obtain maximum ultimate recovery. Maximum ultimate recovery, of course, is not necessarily reserves. We are reducing reserves, but we are not losing maximum economic ultimate recovery.

Mr. VINSON. You are getting the money but not keeping the oil.

Mr. WOODWARD. Well, just like a tank of wheat. If we are going to stockpile wheat and you get a bunch of rats gnawing at the wheat, why, I am trying to get rid of those rats because your stockpile is going away without taking any wheat at the top.

The CHAIRMAN. As far as the shallow zone is concerned it is now or never.

Mr. WOODWARD. Yes, sir.

The CHAIRMAN. Leave the Stevens zone alone. It is safe.

Mr. WOODWARD. Yes, sir.

The CHAIRMAN. It isn't deteriorating. It is all right. We won't disturb it. We won't bother it. We will hold it.

Mr. WOODWARD. That is right, sir.

Mr. Chairman——

The CHAIRMAN. As far as the shallow zone is concerned, where you are losing it, of course it is a matter of prudence to get it while the getting is good.

Mr. VINSON. Mr. Chairman, if you had lived with this as long as I have, you would be of the same opinion as I. At first, we thought we were going to keep the reserve. But these gradual things are nipping there and nipping here, and the reserve is practically gone now. I resisted as strongly as I could, holding it down to the 65,000 barrels during the war. Some people wanted to open it wide up. Probably if we had opened it wide up we wouldn't have as much left there today. But it is certainly to be hoped that for what little is in there, you will adopt and follow the policy of conservation, which was the intent of Congress. If it is necessary to do this, why, in the interest of keeping it in the ground, you have to do it.

If you have to draw out some to keep some, why, you have to work out some system to do it.

But what worries me is: I know what is going to happen. I know you are going to be back here in a short time and you are going to say you must do something else. I know in a short length of time I won't be here. Somebody is going to be dealing with the question of the Stevens zone. I know, because that is the trend of things. That is the way things run. You just can't keep that oil. It is just like the fellow who has a little money in his pocket. It is hot. He has to spend it.

But we have done magnificently up to today. This little stockpile did great service in the war, when we opened it up to 65,000 barrels a day.

I have no criticism of Standard for wanting the oil out of the ground. They are in the business. What I am up here for is to watch the Government's interest, and follow out what President Taft set out as a conservation program. And from that day down to this, there has been a constant raid, geological, scientific, and engineering on the reserve.

As I wrote Mr. Smart when he wrote me about that, I said, "Why, Mr. Smart, you know they can always get figures to fit the case." How in the world can we folks dispute anything like that up there? Why of course we can't do it. But we have confidence in you people. That is why we employed you. And when you come in here and tell us that we have to draw oil out, we want to know what you are going to accomplish. Are you going to get it all and just leave a vacant space in the earth, or are you going to accomplish something by putting a new cork in the bottle?

Mr. WOODWARD. Mr. Vinson, may I say that I will never—and I am sure the Engineering Committee will never recommend—anything unless it is in accordance with sound engineering principles.

Mr. VINSON. Wait one minute. Is that in accordance with conservation?

Mr. WOODWARD. This is in accordance with conservation.

Mr. VINSON. All right.

Mr. WOODWARD. In my opinion.

The CHAIRMAN. All right.

Mr. DOYLE. I am sure every member of the committee just noticed, as I did, the observation of our distinguished colleague when he remarked just a minute ago: He said "Of course, I won't be here," referring to himself.

I just wish to say as a member of the committee, I hope it will be many, many years before it occurs that Mr. Vinson, of Georgia, won't be here to be one of the watchdogs of the interests of our national oil conservation and everything else.

The CHAIRMAN. Knowing how tough he is, I am not worried. He will be here when a lot of the rest of us are gone.

Mr. MILLER. Mr. Chairman.

The CHAIRMAN. Yes, Mr. Miller.

Mr. MILLER. Have the recent earthquakes—seismological disturbances—in southern California anything to do in your estimation with disturbing these faults, and allowing this migration of oil out of the field?

Mr. WOODWARD. No, sir; I think it has nothing to do with it. We have had, perhaps, oh, a little pipeline break at Elk Hills of relatively minor importance.

Mr. MILLER. I don't mean those things that are put in there by man. I mean——

Mr. WOODWARD. No; I think there is no connection.

Mr. MILLER. Has the depletion of oil in fields surrounding this caused vacuums that have caused this oil to flow into it?

Mr. WOODWARD. I think quite probably that is a very great contributory cause. I can't prove that. There seems to be some evidence. But it is a very logical story that can be developed on that thesis. Faulting to the south of Elk Hills, where we know there must be some faulting, may have allowed fluids to leak into the lower pressure sands. That may have caused it.

Mr. VINSON. Mr. Chairman, may I make this statement. I don't want any observation that I have made to be any reflection upon the Navy's engineering advisers. I think we are indeed fortunate in having these public-spirited men and men of expert knowledge on this matter. We always have had the highest confidence in them, and we still have confidence in them.

Personally, I hate to see the time come when it is going to be necessary to depart, as far as the shallow zone is concerned, from the principle that I was hoping would prevail always: a complete conservation in the ground of the oil. If it is necessary to do what you gentlemen say, of course you have every advantage in the world, because we are not qualified to pass on it, and therefore we have to listen to you.

I would like to ask you: Did you read that memorandum that I sent to the Secretary?

Mr. WOODWARD. I have a memorandum which I assume has been.

Mr. VINSON. That is right.

Mr. WOODWARD. Which discusses Elk Hills.

Mr. VINSON. Is there anything there to those suggestions?

Mr. WOODWARD. I would like to make the suggestion—I don't know who prepared this——

Mr. VINSON. I don't, either. I want to state, as I did yesterday: That was sent to me from over in the Armed Services Committee of the Senate.

Mr. WOODWARD. Sir, there are some intelligent points that have been raised in here, but I am sure that whoever did this did not have sufficient data. I suggest if he had a copy of the formal report a number of those problems would be solved. There is nothing in here, no points that have been raised, that disturb me. He just didn't have enough facts.

I would suggest that if he gets a copy of this engineering report, most of the things that concern the gentleman who wrote this letter would be answered. Undoubtedly other things will occur to him. I would be most happy to talk to him. I am sure the Engineering Committee would be most happy to talk to him and show him factual data. If he can show us in any way where we are wrong, we would be most happy to admit it.

Mr. VINSON. Then, to sum it up, I understood you to advise Captain Meade that the recommendation is there must be an increase of 18,000 barrels a day for the time being, and that a constant study will be made, and that you might be back here later on with some other recommendation as your study develops.

Mr. WOODWARD. That is right, sir; and again, I point out in that 18,000 barrels, which is noted on page 3 of the report, that does not include estimates for this project which we have hopes of curing. It does not because we need additional data on productivity of the wells to develop and definitely formulate the program.

Mr. VINSON. Then, the committee can understand all you are recommending and have recommended to the Secretary is the additional 18,000 or total production at the time being of 24,000?

Mr. WOODWARD. That order of magnitude.

Mr. VINSON. Then that would be all that the Secretary would issue a directive on, to increase the production under the management group out there, up to a total production of twenty-four-thousand-some-odd barrels of oil?

Mr. WOODWARD. That is correct. That includes the present production in the north flank, the SS–1 south flank and the 77–2G area. And in connection with that, and also a question, I believe Mr. Gavin asked, as to accuracy of estimates: Those, again, are our best opinion, and please let us have some leeway there in one way or the other.

Mr. VINSON. What is the Secretary going to issue, then? Are you recommending 18,000 barrels, or more?

Mr. WOODWARD. Our fundamental object is to stop the migration, and we tell the Secretary that in our opinion it will necessitate an increase of production on the north flank and the east nose, the 77–2G area, and the SS–1 sand south flank in the amount of approximately 18,100 barrels of oil, and I have forgotten how much water, perhaps 9,000 barrels. Those are the three programs where we definitely have recommendations.

We have also now under study the SS–2 and M as to a corrective program, and we will recommend to him whatever the facts show as a result of our investigation. But our recommendation to him is in effect: "Let's stop the loss; let's conserve the oil."

Mr. VINSON. That is right. I imagine you prepared this letter; did you not, for the Secretary, or have a hand in the preparing of this letter.

Mr. WOODWARD. No, sir.

Mr. VINSON. Well, somebody who knew something about it prepared it, because it is broken down (1), (2), and (3), different sections and different sands, and you itemize, and it is itemized in the statement how much, and therefore how many wells you put into No. 1, which is 3, and you draw out of that 3,100 barrels—you recommended that. That is broken down. That comes up to 18,000 barrels. That is all you are going to recommend to the Secretary, isn't it?

The CHAIRMAN. The drilling of 39 additional wells.

Captain MEADE. If you will permit me, Mr. Chairman, I think I can add something to this.

The CHAIRMAN. Yes.

Captain MEADE. The letter to which Mr. Vinson refers, and which was signed by Mr. Whitehair, in which there were four projects discussed, was prepared upon my advice. I had the benefit of the advice that the Engineering Committee had provided. You will note that there are four projects there described.

Mr. VINSON. That is right.

Captain MEADE. The last page of the letter says, in summing up the position that I recommended to the Secretary and which he adopted in this way:

> The foregoing engineering matters have been under detailed study for some time by the Operating and Engineering Committees, who have already made definite recommendations for increased production as outlined above, with regard to the 77–2G area, and the SS–1 sand on the south flank; they still have under study the problems of migration in the SS–2 and M sand on the south flank, and the water encroachment on the north and east flanks. But it is anticipated that they will recommend further additional production within the next months. Based upon the advice received and subject to any consultation that you may desire, the Secretary of the Navy proposes to authorize the additional production from the shallow oil zone thus far recommended and also to authorize other additional production, if after due consideration it is found that such production is justified for similar engineering reasons.
>
> Such production, when authorized, would be subject to continued review, and production would be reduced if allowed by sound engineering principles.

In effect, the Secretary says that four projects have required study. He has approved the programs recommended for two of them. He expects he will approve programs for the other two problems, when they have had further study. The report before you today goes one step farther and it recommends specific solutions to three of those problems. That is the 18,000-barrel figure.

The resolution of the fourth problem will undoubtedly require an increase in production beyond the 18,000-barrel figure.

Mr. VINSON. But SS–2 and M Sands haven't been sufficiently studied for the experts to advise the Secretary. It is under process of study.

Captain MEADE. That is correct.

Mr. VINSON. Therefore, if the Secretary follows your recommendation today, you only authorize an increase at this time, if you sign the order today, of 18,000 barrels.

Captain MEADE. That is correct, sir.

Mr. VINSON. So when Mr. Woodward and his crowd later on comes in, then the Secretary says "Well, with this additional information, I am warranted to increase it."

Captain MEADE. Yes, sir.

Mr. VINSON. And that prompted you to make your statement in the record of thirty-some-odd thousand barrels instead of 24,000, as the total production.

Captain MEADE. Yes, sir.

Mr. VINSON. Because you anticipate that the finding is going to justify an increase of about 6,000 barrels?

Captain MEADE. Yes, sir; something like that.

Mr. VINSON. Well, that clears it up. It ought to be cleared up.

Mr. GAVIN. Mr. Woodward——

The CHAIRMAN. Mr. Gavin.

Mr. GAVIN. Mr. Woodward, it is going to be difficult to restrict you just to the 18,000 barrels?

Mr. WOODWARD. Yes, sir.

Mr. GAVIN. The facts are that if you drilled 39 wells, any one of those wells might come in for 3,000 to 5,000 barrels. I don't know what they would come in for. But we will just assume that they did.

Now, in that event, what would you do? Say you drilled 10 wells, and you come in under the increase of production from the 10 wells—you are authorized 39, and the increase of production is 18,000 barrels a day. What would you do under those circumstances?

Mr. WOODWARD. We wouldn't produce the wells under that rate, because we don't need the production.

Mr. GAVIN. You would shut them in?

Mr. WOODWARD. Partially; yes.

Mr. GAVIN. Then you would be in the same condition as you are now. The water would permeate the field.

Mr. WOODWARD. That is right; we are going to spot the wells around the north flank to protect that reserve.

Mr. GAVIN. The point I am trying to make: It is going to be difficult to restrict yourself to 18,000 barrels.

Mr. WOODWARD. Yes, sir; it will depend on engineering data.

The CHAIRMAN. Mr. Cole.

Mr. COLE. Mr. Woodward, under the law the Secretary of the Navy is directed to reexamine the field out there from the standpoint of production, and if he shall find that the quantity of the production is no longer required for the national defense, then the quantity of such production shall be reduced to the amount currently required for the national defense.

Parenthetically, I can't understand how we ever allowed that kind of authority to creep into this law, giving him authority to produce for his current needs, which conflicts with our position. At any rate, my question is: Does the determination of the amount of production which is now estimated at 24 to 30 thousand barrels a day in any way reflect a decision of the Secretary of the Navy to produce that amount of oil for the current needs of the Navy?

Mr. WOODWARD. No; I think not, sir.

Mr. COLE. Well, I want your answer corroborated by Captain Meade.

Captain MEADE. I am able to corroborate that, Mr. Cole.

Mr. WICKERSHAM. Mr. Woodward, are the others interested in the conservation of oil in agreement with your opinion; that is, the State oil conservation commission, and the interstate oil compact, if you have one there, as well as the geologists of the Standard Oil and other geologists?

Are they in accord with your observation?

Mr. WOODWARD. Yes. The Interstate Oil Compact Commission doesn't affect California.

Mr. WICKERSHAM. But you do have a conservation commission there? On oil?

Mr. WOODWARD. There is a conservation commission which is concerned with waste. To the best of my knowledge, they haven't indicated anything one way or the other with reference to our problems.

I may state that I have checked with the other members of the engineering committee on the Navy side. They are in full agreement. I have also checked, to be sure that I was doing right, with other members of our firm of DeGolyer & MacNaughton. We have a number of engineers and geologists. I have checked with them, and every source of information that I could find, and we are in agreement.

Mr. WICKERSHAM. You feel also that Standard Oil itself is interested in conservation, too; don't you?

Mr. WOODWARD. I think they are.

Mr. VINSON. Wait one minute, Mr. Chairman. I wouldn't say that even the State of California is interested in conservation because they have no conservation law, if my recollection is correct. Is that correct?

Mr. WOODWARD. That is an interesting observation.

Mr. VINSON. Certainly. Don't come to me talking about anybody out there being interested in conservation. Every State in the Union I think has a conservation law with reference to oil except the State of California.

Mr. WOODWARD. I don't want it to appear that I think the State of California is not interested in conservation. It is a good State.

Mr. VINSON. I merely say it hasn't any oil conservation law.

Mr. WOODWARD. It doesn't belong to the Interstate Oil Compact Commission.

Mr. GAVIN. At that point, Mr. Chairman——

The CHAIRMAN. Mr. Gavin.

Mr. GAVIN. The State of Texas has a very comprehensive law that they follow quite rigidly; is that right?

Mr. WOODWARD. That is right.

Mr. GAVIN. You might briefly tell us of that plan in Texas.

Mr. WOODWARD. I would rather pass that. They have a good law, and it is well administered by the railroad commission, where they control production by setting allowances, even as to individual wells in the field, in an effort to conserve or to obtain maximum ultimate recovery.

The CHAIRMAN. Mr. Bennett, of Florida.

Mr. BENNETT. How long would the shallow yield continue to produce as recommended at 24,000 barrels?

Mr. WOODWARD. We can make just a little arithmetic calculation; 24,000 barrels a day is approximately 9 million barrels per year. If you divide that into 350 million barrels, you get a figure of 40 years. That does not mean the field would last 40 years. I would suggest it would last many times that long.

Mr. BENNETT. Well, if we waited 40 years to recover this oil how much of it would we then be able to recover?

Mr. WOODWARD. Oh, that would be just a wild estimate, sir. It would be appreciably less than 350 million barrels, and the availability——

Mr. BENNETT. Do you feel a material amount of it would be available if we closed this off for 40 years, and tapped it for the first time at the end of 40 years?

Mr. WOODWARD. I think a good portion of it would be lost, sir. It would have washed over the hill, if you shut the field.

Mr. BENNETT. When you say "a good portion," I think it is important to us in the field of conservation to know how much would be available.

Mr. WOODWARD. I would be unable to estimate that, sir.

Mr. BENNETT. Do you think a majority of it there would be available?

Mr. WOODWARD. Oh, I might just take a wild guess: A third to a half of it, perhaps. That is just a wild guess.

Mr. BENNETT. Well, will the bleeding of the shallow zone have any effect upon the Stevens zone, or any of the lower reaches, as far as you may know?

Mr. WOODWARD. It will have no connection whatsoever, I am sure.

Mr. BENNETT. That is all.

Mr. VINSON. Mr. Chairman, may I ask a question?

The CHAIRMAN. Yes.

Mr. VINSON. I want to say that I am perfectly satisfied with the clearing up of the number of barrels of oil. There was a little discrepancy yesterday. Here is one question, and then I am through: Why did it happen that you and the other advisers to the Navy Department recommended after the war they go down from 15,000 barrels to 6,000 barrels?

Because, under your theory the more oil we are taking out now, the more conservation we are practicing. We were taking out 15,000 barrels then, and you recommended that we go down to 6,000 barrels.

Now, how did that come around? Just clear that up in my mind, now.

Mr. WOODWARD. I point out—you are talking about that ceiling of 7,950 barrels——

Mr. VINSON. When you cut down—it stood at 15,000 barrels for a long time, and then you cut it down on somebody's recommendation to 7,000 barrels or 6,000 barrels, whatever it was.

Mr. WOODWARD. We have to use what I call some 20–20 hindsight on that.

Mr. VINSON. That is too deep for my thinking. Just put it in plain English so I can understand. What happened?

Mr. WOODWARD. I will say, briefly, we didn't have enough information at the time.

Mr. VINSON. That is correct.

Mr. WOODWARD. Since those recommendations were made we have drilled wells; we have additional pressure information, and our recommendations are based on the new data.

Mr. VINSON. Now, it might happen from the drilling of these wells you might conclude that you should go back to 15,000 or less than 24,000.

Mr. WOODWARD. I hope we do, sir.

Mr. VINSON. Well, it might——

Mr. WOODWARD. It might. I hope we do.

Mr. VINSON. Yes.

That is all, Mr. Chairman.

Mr. WOODWARD. There is one impression, Mr. Short. I would like to leave with the committee; that in my opinion I don't write off the shallow oil zone. There are still 350 million barrels, of that order of magnitude, there.

Elk Hills is still one of the great fields of the world, and it is a very important field. I don't like the impression left that the shallow oil zone is going tomorrow. It is going to be there quite a long time, and our effort is to try to protect it as long as we can.

Mr. VINSON. May I say, Mr. Chairman; I am glad you made that statement because I certainly wouldn't want to see a hope created in somebody's heart that we are going to let full production out of Elk Hills.

Mr. BENNETT. Mr. Chairman.

Your answer that you gave me a moment ago that possibly half of this reserve would be available at the end of 40 years, if we didn't do anything to tap it, disturbs me a little bit, because it seems to me that is a pretty substantial amount of oil in the problems this country is going to be facing in the next 40 years.

Would you mind telling the committee how you come to the conclusion that if you could save half of this oil for 40 years by not tapping it, how it would be consistent with the policy of conservation to take out 24,000 barrels a year?

Mr. SMART. 24,000 a day.

Mr. BENNETT. I mean 24,000 barrels a day.

Mr. WOODWARD. In the first place, when I say half, I have not made such a study, and I wish you wouldn't hold me to that too definitely. I don't know.

Mr. BENNETT. How can you intelligently answer the basic question of this whole inquiry if you don't know approximately how much would be available by not tapping this oil?

Mr. WOODWARD. Well, my concern, to get back, I know if we don't produce this, if we don't produce oil and water—for example, on the north flank I know we are going to lose oil.

Mr. BENNETT. Well, you still think half of it is going to be left at the end of 40 years if you don't touch it?

Mr. WOODWARD. I can't say half is going to be left. I don't know.

Mr. BENNETT. If you can't make a guess, how can you testify to anything you testified to here?

Mr. WOODWARD. I know today oil production is being lost and availability is being lost. I want to protect that. Consider an area where we are losing oil such as in the SS–2 and M sands. I want to stop that pressure gradient, produce oil and gas up there until we flatten out this pressure gradient and then produce no oil.

The CHAIRMAN. A few things you definitely know, and there are a lot of things you know nothing about.

Mr. WOODWARD. That is right, sir.

The CHAIRMAN. Mr. Miller, of California.

Mr. MILLER. Well, I started to ask you about the effect these other fields might have on this field.

In other words, at one time in the state of nature, before this field was tapped, can we assume that it was in a state of equilibrium as far as the oil in the field was concerned?

Mr. WOODWARD. Yes, sir.

Mr. MILLER. There was no migration of water, then, coming into it or the pressures were such, or do we assume that the pressures were such, that there was that equilibrium existing?

Mr. WOODWARD. I have done a lot of worrying on that general thesis, sir, and have tried to find out why all this is happening.

I have a chart——

Mr. MILLER. Frankly, that is what I would like to know: What disturbed the equilibirum, and whether we can reestablish that equilibrium.

Mr. WOODWARD. This will take just a few minutes. It is something that is not subject to proof, but I think there is a reasonable explanation for it, if I may have the time.

Gentlemen, this is not an exhibit. It is some work that I have been doing in Dallas. It is also the work of some geologists that have worked at Elk Hills. It generally shows the southern portion of the San Joaquin Valley. At this point lies Elk Hills. To the south is Buena Vista Front. Further to the south is Buena Vista Hills. And then comes the Midway Sunset field. We have traced these sands to find out where these sands are. We have a line showing the pinchout or shaling out of those sands. Where they go to the north I can't say. We don't have sufficient evidence. Again, this is largely conjecture. But they do in general continue to the northeast. Again to the south they will tend to shale out just below the Midway Sunset field.

These sands will outcrop over in the mountains over around Kern River to the east of Bakersfield. In geologic time oil was deposited in this basin and water was fed from the mountains. Oil then collected in structures, one of which was Elk Hills. A lot of oil collected there, and a lot of oil collected in these other fields there. So that at one time perhaps, well, as late as a hundred years ago, but certainly for millions of years, undoubtedly a static condition existed. There was no tendency for oil to move off of Elk Hills. There was no tendency for oil to move anywhere, because the whole thing was filled up.

This great area of sand, which is filled with water, is what we call an aquifer.

I would suggest that somewhere in an east-west direction from Elk Hills we run into difficulty in having a permeable sand which will permit water to go from the north to the south. For example, at Elk Hills the SS–1 sand in one area gets almost 100 feet thick. In all directions, of course, it thins out. To the east it tends to finger out, become thinner and it shales out. We know there is a terrific amount of faulting there. I suggest the possibility that in the eastern portion here [indicating] water in the northern portion has difficulty moving to the south. So we have in essence two aquifers here. I'm sorry I can't prove it definitely to you gentlemen, but I think that is what happens.

Now, in the northern portion of this aquifer, the only production from the shallow sands is right along the north portion of Elk Hills. The other fields you see, like Coles Levee and Ten Section, are deeper sands. But the only shallow sand production in the northern aquifer is from the north flank of the Elk Hills.

Now, that is a very small amount of production in comparison with the total volume of the aquifer. To the south, if we subscribe

to the production theory, which is not provable, we have taken out from Midway Sunset, Buena Vista Hills, Buena Vista Front, those fields, approximately 1 billion barrels of oil.

Mr. MILLER. Is that shallow well sand or deep oil?

Mr. WOODWARD. Shallow sand, comparable to those at Elk Hills.

I won't belabor you with a general change in the type of sedimentation out here, but I think there also may be some difficulty of moving water freely through the northern aquifer. But from sands of general comparable stratigraphic depth in fields to the south there has been taken out of there on the order of magnitude of a billion barrels of oil. I don't know how much gas, but I would suggest of the order of magnitude of a trillion feet of gas. How much water, again, I don't know, but it is very large. It may be a billion, it may be more, it may be less.

Now, the effect of that—first, to go back to the north. Only very little has been taken out. Hence we still have high pressures. There is no reason why the pressures would decrease. To the south we have taken out all of this production. That would tend to decrease pressures on the south. So the only thing that can happen is this water to the north is trying to get down to the south. It can't get down very well out in here, because of the change in sedimentation. The best place for it to get by is right at Elk Hills. We have beautiful sands there, very permeable sands. It will also try to run around the edge of Elk Hills and we find trouble there, too. That may be a reason.

Now, I will not say that the production on these other fields has caused that. It is a reasonable explanation. Again, in the area immediately south of Elk Hills, it may be faulting that would allow a release of pressure. I——

Mr. GAVIN. Mr. Chairman——

Mr. WOODWARD. I can't prove it, but that is a generally reasonable concept that would show you the cause of all our troubles.

The CHAIRMAN. Mr. Patten.

Mr. PATTEN. On that basis, then, how do you justify that taking gas and oil from the center there is ever going to even up the pressure?

Mr. WOODWARD. We have to continue to take it out of the north because if we take fluids out of here fast enough—you still have the high pressures on the north. Here, for example, is the north side of the field, and pressure decreasing from the south. If we continue to take out here fast, we will drop pressures immediately below, and then we will try to level them out.

The CHAIRMAN. Mr. Gavin.

Mr. WOODWARD. The only reason for taking it out is to stop the gradient to the south.

Mr. GAVIN. The question here is, How long this shallow zone will produce? It might be interesting to the committee to know that Pennsylvania grade crude field, which is a shallow field, has been producing oil for over 90 years, and it is still producing about 60,000 barrels a day, more, or less, at the present time.

It is also interesting to the committee to know that today in the Pennsylvania field they are using water-flooding process that the gentleman has described here to get the oil out of the earth. In other words, they pump the water into the earth to push it toward the well, and then take out the oil; is that not correct?

Mr. WOODWARD. That is correct. You have a different situation there.

Mr. GAVIN. So it is a question, on this field here, how long it will last. I think it will last for a good many years and I think you would agree with me on that score.

Mr. WOODWARD. I do, sir.

Mr. GAVIN. Even though it might deteriorate to some extent, by the present methods they are going to recover a great portion of that oil that is in the earth.

Mr. MILLER. Is there any similarity to the geological conditions in Pennsylvania and those in this field in California?

Mr. WOODWARD. Conditions on that water-flood type——

The CHAIRMAN. Does that conclude your testimony, Mr. Woodward?

Mr. WOODWARD. Well, I could go on for a week, but I think that is essentially it.

The CHAIRMAN. You have given us a pretty comprehensive and clear picture. Because time is running out on us, we would like to hear from Mr. Floyd Bryant, vice president of the Standard Oil Co. of California.

The committee wishes to express its appreciation for your appearing before it, Mr. Woodward, and the fine presentation you made.

Mr. WOODWARD. Thank you. I appreciate the committee's courtesy.

The CHAIRMAN. It has been very helpful to all of us.

STATEMENT OF FLOYD BRYANT, VICE PRESIDENT, STANDARD OIL CO., OF CALIFORNIA

Mr. BRYANT. Mr. Chairman, and members of the committee——

The CHAIRMAN. Mr. Bryant.

Mr. BRYANT. Thank you.

I think most of the senior members of this committee will have remembered me on many occasions here. I appreciate the courtesy of appearing, but I was thinking this morning that this makes about the 10th year that in various periods I have appeared before you. That happens to be about one-third of my employment with the Standard Oil Co. of California, by the way.

Consequently, because I was the representative of this company in the creation of this very complicated contract, I have kept in very close touch with all phases of these operations, not from the standpoint of engineering because I am not an engineer, but to be as certain as possible that the obligations which we assumed when we became a partner with the Navy Department in this field were conscientiously and properly carried out.

Mr. Vinson, before whom I have appeared many times, I believe will verify the fact that at least we have tried——

Mr. VINSON. No doubt about that. I will say for the record, Mr. Chairman, while we have a very peculiar kind of partnership with entirely different objectives, nevertheless we have been working most satisfactorily together.

Mr. BRYANT. Thank you very much.

Mr. COLE. If every shotgun wedding would turn out as happy as this one is, our society would be much better off.

Mr. BRYANT. Thank you, Mr. Cole.

I propose to make my appearance, therefore, because this is essentially a technical operational matter, quite brief, and later to turn over to my associate, an executive assistant, Mr. Thacher, the opportunity to give you just a very brief—not a repetition of what has been said, but a very brief additional statement which he had prepared for our company.

I wouldn't take any more of your time except for the fact that some of the discussion to which I have listened suggests some comments which I think are pertinent.

In the first place, I think that most of the members of this committee realize that this is an old field in part. I think that one of the previous witnesses testified to the fact that before the extension to its present boundaries of the reserve, there had been a considerable amount of production in what is now a part of the reserve on the north and east flank over a considerable period of years.

Obviously, that introduced changes in reservoir balances which made this a very difficult problem when we tried to organize this field as a stockpiling project.

I think the testimony of the engineers has made that very clear, and I don't propose to go into it, but simply remind you. I might also remind the committee there was a long period of time during which my company, owning these various alternate sections within what is now the reserve, made no effort to develop the interior by virtue of an agreement which we had, which our predecessors made with the Federal Government, because of the concern of the Federal Government as to the effect on Federal lands of the development of those areas within the original reserve.

Now that contract, which was really only a letter agreement, existed from the early twenties well into the latter thirties, and it was only because of the increased petroleum demands arising out of the beginning in Europe of the Second World War before we went into it that caused us to raise the question as to the necessity of drilling in the reserve and out of that, over a period of years, developed this unit-plan contract.

Now, it seems to me somewhat unfortunate that the pool we are talking about now happened by force of natural phenomena to create so many difficulties with respect to the retention within the pool and in a static condition of all of the possible reserves that could be maintained there.

It is unfortunate, because I appreciate very deeply the philosophy of Mr. Vinson on this subject, and I think the record will show that there has been a very diligent effort, notwithstanding this physical problem, to accomplish the end point of the agreement.

I think it also is illustrated by virtue of the fact that these requests for additional production programs have been delayed a long time. I don't think that we should criticize the members of the Engineering Committee or anybody else who had to do with the operation of this field for what may appear to have been tardiness in suggesting this increase, but, rather, I should say, to encourage them and to give them credit for the fact that they tried every other known expedient, apparently, in an effort to accomplish the objective of maintaining this pool without additional offtake. So the time factor, I think, lies in the long period of experimentation which went on in an endeavor,

after the large offtake during the war, and the very small allowable thereafter, to solve these problems.

Mr. VINSON. Yes.

Mr. BRYANT. As I said before, we are very conscious of the position that we occupy as a partner in this enterprise, and it has been my primary obligation to see that we meticulously follow each and every one of the obligations of that contract.

That, I believe, has been evidenced by the record.

Now, there is no need of my taking any more of this committee's time. I said I would like to have Mr. Thacher follow me. Mr. Thacher is an engineer with an excellent technical background and with considerable experience in actual oil-field operations. He has been paying primary attention to this particular subject as a member of my staff for the last several years, and with your permission I would like Mr. Thacher to take the stand.

The CHAIRMAN. Thank you very much, Mr. Bryant.

Mr. MILLER. Mr. Chairman.

The CHAIRMAN. Mr. Miller.

Mr. MILLER. California's good name having been taken in vain, as not having a conservation program, I would like to say for the record that it isn't because of the actions of the major oil companies that it hasn't, because when a bill was last referended that did give us a conservation program similar to other States, the major oil companies threw their weight behind that bill and unfortunately the referendum lost, and the bill was stricken from the statute books; isn't that right, Mr. Bryant?

Mr. BRYANT. That is absolutely correct, sir.

Mr. MILLER. Of course, if some 10 years before that time the major oil companies had seen the necessity for conservation and had lent as much weight when the original Sharkey bill was on the ballot, maybe we would have had a conservation bill; isn't that right, too?

Mr. BRYANT. That could well be, sir.

The CHAIRMAN. Thank you very much.

Mr. MILLER. I think that is the record.

Mr. WILSON. Mr. Chairman.

The CHAIRMAN. Just a moment, Mr. Bryant.

Mr. Wilson.

Mr. WILSON. It is merely an observation. I kept very still here, being a new Member of the Congress. I am a Californian, and I want to point out there are four Californians on this committee, and in the absence of any oil-conservation law out there, I think it would behoove us to be very much interested in the Federal Government's conservation movement. I think it is all a point of view, just to make an observation, as to what is good conservation. I think you mentioned, sir, that ultimate economic maximum recovery of oil was good conservation. I would like to refer back to the statement about the rats nibbling the grain. I think the point of view as to whether you are a minor owner of that grain or a major owner of the grain might differ. That is, if you owned a lot of other grain, and you were losing some, you could see from a business point of view that it might be well to try and prevent any future loss, but if you were dependent on that major supply of grain as your reserve, you might be willing to let it be nibbled away if you knew that the main portion of it was going to be saved over the years.

That is merely an observation, and probably isn't very profound. I think we in California must be concerned about this reserve.

Thank you.

The CHAIRMAN. All right. Thank you.

Mr. Thacher.

Mr. THACHER. Mr. Chairman——

Mr. DOYLE. Mr. Chairman, may I just remark, as long as attention was called to the fact, that California happens to be my native State. I felt for a long time that my State of California should have an adequate conservation law. I feel that same way this morning, very vigorously.

Mr. COLE. Mr. Chairman, I ask unanimous consent that the absent member of the committee from California may extend his remarks.

Mr. THACHER. Mr. Chairman——

The CHAIRMAN. All right, now, Mr. Thacher, we will be glad to hear you.

STATEMENT OF J. H. THACHER, Jr., EXECUTIVE ASSISTANCE TO THE VICE PRESIDENT, STANDARD OIL CO. OF CALIFORNIA

Mr. THACHER. All right, sir. My name is J. H. Thacher, Jr. I am executive assistant to the vice president, Standard Oil Co. of California, and concerned particularly with Naval Petroleum Reserve No. 1 (Elk Hills).

The House Armed Services Committee has heard a presentation by representatives of the United States Navy and consultants as to why they deem it necessary to take certain corrective action in the shallow oil zone in Naval Petroleum Reserve No. 1 at Elk Hills.

Standard Oil Co. of California concurs that the action recommended should be taken, based upon the conclusions reached by the Elk Hills Engineering Committee in their report of February 1953, entitled; and that is the report that you have, gentlemen, "Review of the State of Readiness Program, Shallow Oil Zone 1945–52—Recommended Programs for Future Operation With Particular Reference to Present Losses of Availability and Ultimate Recovery."

Both Navy and Standard have an immediate interest in this question of loss of oil from the shallow oil reservoir, since each has a substantial share therein.

While under the unit-plan contract the Navy alone controls the rate of production from the field, the Engineering Committee's latest report estimates that Standard owns 33.0848 percent of the reserves in the shallow oil zone. Accordingly, approximately one-third of any oil being lost from this zone belongs to Standard.

The Elk Hills Engineering Committee, comprising six members, was established under the terms of the unit-plan contract, dated June 19, 1944, and the amendatory and supplemental agreement, dated December 22, 1948.

Two of the members are the representatives of Navy and Standard, respectively, on the operating committee, and the remaining four are petroleum engineers or geologists—2 of whom are appointed by Navy and 2 by Standard. This committee has given long and detailed study to the geologic and engineering problems of the Elk Hills field.

The objectives of the unit plan contract are specific and are quoted by the committee in the foreword to their report. Of special concern

to Standard are sections 6 (d) (iv), 6 (d) (v), and 6 (d) (vi) of the recitals of the 1944 contract. They read as follows:

6 (d) (iv) Result in the eventual receipt by Navy and Standard, respectively, from the various commercially productive zones underlying the reserve of the quantities of recoverable oil, gas, natural gasoline, and associated hydrocarbons underlying their respective lands as of November 20, 1942.

6 (d) (v) Provide for the economic and efficient development and operation of reserve.

6 (d) (vi) Result in securing the maximum ultimate recovery of oil, gas, natural gasoline, and associated hydrocarbons from the reserve.

In carrying out such objectives, the operating committee, along with other important functions is required by section 3 (b) (4) of the contract to use "sound oilfield engineering practices designed to achieve the maximum economic recovery of oil from the reserve."

Let me add I was quoting verbatim from the contract in my previous quotations from those sections.

In consummating the 1944 unit plan agreement neither Navy nor Standard contemplated the occurrence of losses from the reservoir of the magnitude set forth in the engineering committee report transmitted to you.

Today we are confronted with a situation which threatens to prevent the attainment of the objectives of the unit-plan contract outlined above unless corrective action is taken.

The history of production from the Elk Hills field readily falls into three periods:

1. The prewar period: 1920 to 1942, which was before any unit-plan contract covering operation of this field. During this period some 160 million barrels were produced, of which some 99 million were withdrawn from lands then outside Naval Petroleum Reserve No. 1.

2. The war period: Additional lands were added to the reserve in 1942. From 1942 through August 1945, some 27 million additional barrels were produced. It is especially significant to note that of the estimated total recoverable oil in the shallow zone (approximately 550 million barrels) about one-third had been withdrawn by the end of the war, leaving the shallow zone in various stages of depletion with problems of unbalanced pressure distribution and serious water encroachment.

3. The postwar period: From the end of the war to the present time production was about 19 million barrels.

Prior to the end of the war, Navy requested that a postwar program be developed in order "that the reserve may be maintained in good oilfield condition, including availability on short notice for the future production of oil" (Commodore Greenman to Mr. Toussaint, August 14, 1945).

The "state of readiness" program was initiated to obtain information necessary to satisfy this request.

It was recognized that certain adverse effects might perhaps ensue from the institution of certain of the recommended programs. For example: In the major water-encroachment project on the north flank of the field there was the possibility that encroaching water might not efficiently sweep the oil from the oil sands. Under such possibility oil would be bypassed and both ultimate recovery and availability would be adversely affected. However, the possible gains from the entire program warranted its approval by the engineering com-

mittee. This group assumed the duty of continuous review to determine the effect of each of the recommended programs.

Since that time, and in fact since the execution of the unit plan contract, the engineering committee has made extensive efforts to accumulate pertinent reservoir information and to explore all possible avenues of correcting the complex physical problems within the shallow oil zone by means other than oil production. The method of control employed in normal oilfield practice would be continuous selective production from the reservoir.

By such production, the adverse effects incident to water encroachment, gas-cap expansion and other similar reservoir occurrences would be minimized. At Elk Hills, however, attempt was made to control fluid movement, in part stimulated by wartime operation, by methods other than production.

Continuous attention has been given by the members of the engineering and operating committee to the trial programs and reservoir studies comprising the state-of-readiness program. Wherever possible, action has been taken to protect the reservoir, but with a minimum of production.

Despite these diligent efforts, it is now increasingly apparent that large oil losses have been, and are occurring, which seriously damage the shallow oil zone's future effectiveness as a reserve. The engineering committee has finally concluded that, to offset these losses, higher rates of production are essential. However, such rates, though higher, will be kept to the minimum necessary to accomplish the necessary objectives.

The engineering-committee report has been discussed in some detail in the course of this hearing. Briefly, the report reaches the following conclusions:

1. North flank of the shallow oil zone: As to the north flank of the shallow oil zone, edgewater continues to encroach and, unless controlled, will cause material reduction in ultimate recovery and availability for emergency production.

To combat the effects of this encroachment, a program of production of selected existing wells, repair of 6 wells, and additional drilling of 36 new wells in this area is proposed.

2. South flank of the subscales No. 1 sand of the shallow oil zone: In the SS–1 sand of the shallow oil zone, oil is moving downstructure and into edgewater sands. It is the engineering committee's belief that all of the oil migrating into edgewater sands will be irrevocably lost unless additional wells are drilled in the area of migration. If such wells are drilled, it is possible that approximately one-half of the oil so migrating may be recovered. On the other hand, such oil movement and resultant loss can best be controlled immediately by producing existing wells on the south flank of this sand.

3. Subscales No. 2 and Mulinia sands of the shallow oil zone: In the SS–2 and M sands of the shallow oil zone it is agreed that oil is moving downstructure into water sands. At one time the engineering committee recommended a program for correcting this situation. However, changes in pressure distribution and other factors (p. 49 of the report) within the SS–2 and M sands led the engineering committee to conclude that further data should be obtained. Limited production has been authorized by Navy to provide additional information needed by the engineering committee to complete their analysis and recom-

mendation in regard to this area, and that was very thoroughly and ably covered by the gentlemen who preceded me this morning.

4. 77–2G area of the shallow oil zone:

In the 77–2G gas-cap area in the east end of the shallow oil zone problems exist of an expanding gas cap forcing oil into water sands and encroaching edgewater from the north. The loss taking place in this area may be controlled with a program requiring the drilling of three replacement wells downstructure to retard further water encroachment; returning to production of all SS–2 wells in the area which are capable of production, and placing of wells in the gas-cap area on production.

In view of the comprehensive nature of the engineering report submitted to you, there seems little need for us to restate the details which have led to the conclusions set forth in the report and very briefly summarized above.

The data on which the conclusions are based have been secured over a period of years of intensive study of the individual problem in each area (and its relation to the shallow-oil-zone area as a whole) and after careful investigation of the practical alternates to the presently proposed course of action.

As a result of the corrective measures recommended by the Engineering Committee, the current production from the shallow oil zone will be increased by approximately 18,000 barrels a day, and may possibly be increased still further when the Engineering Committee reaches a conclusion with regard to the sub-Scalez No. 2 and Mulinia sands.

At the present time, losses in both current availability and in ultimate recovery, are occurring because of water encroachment and because of the migration of oil into water sands. In the future, migration losses may decrease somewhat, but losses from encroachment will undoubtedly increase. Without corrective action of any kind, it is estimated that the ultimate losses in the shallow zone from both causes in 10 years will be 42,000,000 barrels, or an average for the period of about 11,500 barrels a day.

An important consideration to Navy and Government and to Standard is the financial magnitude of the losses now occurring.

On the basis of a net value of $1.75 per barrel for shallow-zone oil—based on prices and costs as of January 1, 1953, and without recognition for the price increase of some 21 cents per barrel in February 1953—the 42-million-barrel loss over a 10-year period has a dollar value of some $73 million. Again, we emphasize that the unit-plan contract did not contemplate the continuation of an uncorrected loss of this magnitude, both in barrels and in dollars.

The only substantial new investment in facilities will be the cost of some 36 wells on the north flank of about $40,000 per well, or a total of approximately $1.5 million. These wells will help control water movement and will assist in the north-flank program designed to maximize ultimate recovery and to preserve, insofar as may be possible, ability to produce oil from this area in an emergency. It is estimated these wells will produce some 5 million barrels of oil over the next 10 years while serving their primary function as agents in the water-control program. The value of such production, at $1.75 per barrel, would be on the order of $9 million (eight-ninths of which will go to the Government), as against a cost of some $1.5 million (of which Navy will pay eight-ninths currently but only two-thirds ultimately). It

would seem logical, therefore, that these wells should be approved as part of the conservation program.

In spite of the complex geological and engineering factors involved in the shallow oil zone, the issue is relatively simple: An estimated loss of oil is occurring in the zone. If it is not controlled, the loss may amount in 10 years to some 42 million barrels, worth about $73 million. This loss, then, and its control, is the central issue before us today.

If corrective action is not taken, ultimate oil recovery will be reduced. This clearly would be a departure from the basic principles of the unit-plan contract.

The program of selective production recommended by the Engineering Committee is sound and necessary.

Standard concurs with and urges the adoption of this program.

Thank you, sir.

The CHAIRMAN. Mr. Thacher, that is a very scholarly, well-prepared statement.

Mr. THACHER. Thank you, sir.

The CHAIRMAN. Quite convincing, I think.

Mr. THACHER. Thank you, sir.

Mr. COLE. Mr. Chairman, I would like to inquire, if I may——

Mr. THACHER. Yes, sir.

Mr. COLE. Why the disparity in the estimates of the losses between your figures and the Navy's figures? They say there will be a loss of 5,000 barrels a day and you estimate pretty near twice that.

Mr. THACHER. May I answer that, sir?

Mr. COLE. I would like to know. I assumed you all have been working together.

Mr. THACHER. Right.

Mr. COLE. And I wonder why you are so far apart.

Mr. THACHER. I would like to say at the start there is no disparity. There is more than one loss figure discussed in the report. Now the figure of 5,000 barrels a day that was discussed by the Navy is the oil irrecoverably lost that is moving down into these water-wet sands. The Engineering Committee has indicated that the total amount of migration might be on the order of 10,000 barrels a day. They have also indicated that if no action is taken at least half of that would be lost, or 5,000 barrels a day. I think the figure of 5,000 barrels a day is entirely correct, and is a part of the engineering report. The Engineering Committee in their desire to explore the thing as fully as possible also dealt with the question of the loss over a 10-year period, in all the areas.

Now as you will recall from Mr. Woodward's very comprehensive statement, there were two areas of loss where oil was migrating into water-wet sands. There were other areas in which water was encroaching and surrounding chunks of oil. Now the two areas of oil migration, into water-wet sands were, I think, the areas in regard to which—both Navy and Mr. Woodward on the first day of testimony used the figure 5,000 barrels a day of loss. It is my understanding that this 5,000 barrels per day is the portion of that migrating oil which is irrecoverably lost in those sands.

Mr. COLE. Then these remedial measures are not going to prevent continued losses.

Mr. THACHER. These——

Mr. COLE. The best that it would do is roughly reduce the losses in half?

Mr. THACHER. May I say this, sir?

Mr. COLE. Is that right?

Mr. THACHER. The program which has been outlined to you is designed to prevent the oil from getting into the water-wet sand. If it doesn't get into the water-wet sand, it is not lost.

And that I believe is the objective that the Engineering Committee has in mind. If the oil does, by virtue of failure to produce upstructure, actually get down to these water-wet sands, then the figure that Mr. Woodward and the Navy used is the representative figure of irrecoverable loss.

Just to summarize: the purpose of the program is to avoid insofar as possible the oil migrating down and commingling with the water in these water-wet sands and that is the objective, sir.

Mr. COLE. I recall yesterday asking Captain Meade or one of them: with these steps, to what extent would that reduce the losses of oil through migration or the contamination of oil by water encroachment, and they said, indicated, it would reduce it to substantially 100 percent.

Mr. THACHER. I agree. Perhaps, sir, it is my fault not to have made the point clear. But as this oil migrates downstructure, as shown on one of Mr. Woodward's charts, if you can pick up the oil in existing wells before it reaches the water sand then you can recover it. If it moves down to the water sand; if nothing is done and it penetrates the water sand, then you have a substantial loss of which approximately half, as stated by the committee, will be irrecoverably lost, sir.

Mr. COLE. Will we still continue to suffer losses even though these remedial steps are taken?

Mr. THACHER. I would answer that by saying that the opinion of the committee as I read their report is that this is the best way they can devise to eliminate those losses. I do not believe that I can tell you as an absolute guaranty there will be none, but I do feel after careful reading of it——

Mr. COLE. I do not understand how you estimate we are losing 11,500 a day now and by taking these steps we are going to terminate the loss of 5,000 barrels a day.

Mr. THACHER. The 11,000——

Mr. COLE. Why you should now have a doubt in your mind as to the continuance of other losses?

Mr. THACHER. There is no doubt in my mind, Mr. Cole, that this is the best program that can be devised. There is no doubt in my mind that if you can prevent the oil from entering the water-wet sands there will be no loss. There is no boubt in my mind that if you can produce the oil on the north flank, as Mr. Woodward indicated, before it is surrounded by water, that you can recover it.

Mr. GAVIN. At that particular point, though, your production is going to be restricted. On your theory, this remedial measure is going to protect this field.

Mr. THACHER. Yes.

Mr. GAVIN. I quite agree with you.

Mr. THACHER. Yes.

Mr. GAVIN. But if your production is restricted and you cannot take out the oil and you know that this condition exists, we are still in pretty much the same position as we were, unless we could go in

there anew and move in before the water moves in and take out all the oil. Then your remedial measures are fine. But if you are going to be restricted in your production, then you are going to have the same condition you have right now.

Mr. THACHER. You make an excellent point, sir, and I would answer it by saying that if the production is restricted to the current rate, then certainly these losses will occur.

Mr. GAVIN. I wonder if the chairman—Mr. Vinson, did you hear that?

Mr. VINSON. Oh, yes; I heard that. They open it up wide and squeeze the lemon dry.

Mr. GAVIN. Well, if you are going to protect the oil, that is about the solution of it, isn't it? I mean if you are going to protect the field and get the greatest amount of oil out of the earth while this condition exists, you would have to do as Mr. Vinson states, squeeze the lemon dry.

Mr. THACHER. Well, I would like to call your attention, sir, to the title of the report, which is "with particular reference to present losses of availability and ultimate recovery." The committee has been very much concerned and has devoted a great deal of attention to the problem of availability. It is set forth in here rather fully. I think they have said it better than I could. But I want to assure you that that question of availability, which is so paramount in the minds of the committee, was also paramount in the minds of the engineering committee at the time they made their study.

If I may add one further phrase, sir: We have a somewhat imperfect vehicle here for the carrying out of the basic policy which the Congress has desired. The committee is devising a method for making that vehicle as effective as they can, but they cannot create a new and perfect vehicle.

Mr. VINSON. But that does not apply, though, to the Stevens zone. That is a perfect vehicle and the policy of the conservation can be fully carried out there, isn't that correct?

Mr. THACHER. Mr. Vinson, I have no information to lead me to any other conclusion. It is a satisfactory vehicle.

Mr. VINSON. That is a good way to answer it, then. You do not find any information by diligent research that will cause you to reach a different conclusion.

Again, I know how alert minds are and how persuasive certain facts are. So I trust you will just concentrate on something else than that field.

Mr. THACHER. May I deal with that point, sir, if I may, for a moment, sir?

Mr. VINSON. Yes.

Mr. THACHER. Thank you. I can assure you, sir, that we are very conscious, as Mr. Bryant stated, of our obligations under the contract. In the case of the Stevens zone, we recommended strongly through our representative on the operating committee that no gas be taken out of the field, even if you had to open it up for emergency purposes.

Now, that gas has a high commercial value, would be of value to Standard Oil Co. We recommended that none of it be sold. We recommended that all of that gas from the Stevens zone be injected back into the reservoir because by so doing you could best accomplish the objectives that you, sir, have set forth.

Our recommendation in that case was to return that gas to the reservoir. And since the gas is one of the largest factors in the Stevens zone, we as operator, then, after necessary review and approval by Navy, through its representative on the operating committee, proceeded to construct a plant to effectuate that policy.

Mr. VINSON. And is that being carried out?

Mr. THACHER. Yes, sir; that plant is built and ready for your service at any time.

Mr. VINSON. Then everyone is working toward the true objective of the legislation and the policy of the Congress, bona fide true conservation down in the Stevens zone?

Mr. THACHER. Yes, sir.

Mr. VINSON. Is that correct?

Mr. THACHER. If I may answer that question, sir, we have no information which would lead us to believe that you can't accomplish that.

Mr. VINSON. Well, are you trying to get information that would cause you to conclude that there shouldn't be a policy of true, genuine conservation, down there? Are you trying to work up a case?

Mr. THACHER. No, sir. We are simply endeavoring to give the Navy the benefit of our experience as to what is good oil field engineering practice to accomplish the objectives which you, sir, have set forth.

Mr. VINSON. Now let me ask this, Mr. Chairman. One question.

The CHAIRMAN. All right.

Mr. VINSON. Now, in reference to the construction of the wells—I will have to ask the captain:

Have you made an application to the budget or request to the budget for the money to construct the wells?

Captain MEADE. In the 1954 budget, sir, there is an item of $500,000 to begin construction of these recommended wells. That has been put in there tentatively with the understanding that it has not yet received the sanction of this committee.

Mr. VINSON. Now, the whole expense of the construction of wells is borne by the Government?

Captain MEADE. No, sir; I must correct a statement I made yesterday.

Mr. VINSON. That is what I wanted to try to develop.

Captain MEADE. Yes, sir.

Mr. VINSON. Because at least Standard has some interest in these wells.

The CHAIRMAN. They explained that yesterday.

Mr. VINSON. They did?

The CHAIRMAN. Sure.

Mr. VINSON. How much, then?

Captain MEADE. Standard is required to pay in proportion to its participation share.

Mr. VINSON. That is right.

Captain MEADE. In other words, approximately one-third of these costs will ultimately be borne by Standard.

The CHAIRMAN. We hope to have the Secretary of the Navy here next week, and this committee can reach a quick decision. We want to dispose of this matter, because it is very urgent.

This one item just mentioned here is in the budget, but it is held up pending the approval of this committee.

Now, the chairman and Mr. Vinson will have to go to the House Expenditures Committee next Tuesday to get $150,000 for a special investigating committee.

Mr. GAVIN. Mr. Chairman.

The CHAIRMAN. It is past 12 o'clock. We will give you another question.

Mr. GAVIN. If the remedial recommendations for this field are followed and your production is restricted and this water condition exists, you will still be in the same position as you are right now? You will have some knowledge from your experimental drilling of these wells as to the field. But the oil is still in the earth, and it is going to be lost if the water moves in on it?

Mr. THACHER. Yes, sir.

Mr. GAVIN. So the only thing you can do to get the greatest value is get the oil out as rapidly as you can; is that not right?

Mr. THACHER. If I may answer your question as I understand it, sir, if the program as recommended is followed, that will amount to the amounts of oil discussed with Mr. Vinson this morning, it will do exactly what you say: provide us additional very important information which will permit the continuation of this program to maximum ultimate recovery and to preserve availability; yes, sir.

Thank you, Mr. Chairman.

The CHAIRMAN. We would like for the representatives who can to hold themselves available for some day next week. The Secretary hasn't indicated what day he can appear before us, but we would like to take up perhaps a little matter on your Naval Reserve No. 2. I think perhaps we could dispose of it in a half hour, couldn't we, prior to the testimony by the Secretary, and then the committee will try to reach a quick decision.

We will stand recessed, subject to call of the Chair.

(Whereupon, at 12:03 p. m., the committee recessed, sine die.)

NAVAL PETROLEUM RESERVES

FRIDAY, MARCH 6, 1953

HOUSE OF REPRESENTATIVES,
COMMITTEE ON ARMED SERVICES,
Washington, D. C.

(The committee met at 10 a. m., the Honorable Dewey Short, chairman of the committee, presiding.)

The CHAIRMAN. The committee will be in order.

For the benefit of the members of the committee, I would like to make an announcement: In pursuance of the authority conferred on me as chairman of the Armed Services Committee by House Resolution 125, 83d Congress, first session, I appoint the following members as a subcommittee, special subcommittee, to conduct studies and investigation authorized under House Resolution 125: William E. Hess, chairman; Paul Cunningham, William H. Bates, Charles T. Nelson, F. Edward Hébert, O. C. Fisher, and Porter Hardy, Jr.

I authorize the chairman of the subcommittee to issue subpenas over his signature, and I direct that such subpenas be served by any person on the staff assigned to the subcommittee.

The subcommittee will report to me the results of their studies and investigations, with such recommendations for legislation or otherwise as the subcommittee deems advisable.

Pursuant to the authority conferred upon me by the Committee on Armed Services in the authorization contained in House Resolution 156, 83d Congress, first session, I have employed, with the concurrence of the ranking minority member, John J. Courtney as special counsel and I have assigned to him work with the subcommittee in its studies and investigations.

The appointment of this subcommittee is effective as of March 2, 1953.

I think I announced this to the members of the committee, but this is to make it official and a matter of record.

Members of the committee, we have resumed our hearings this morning on Naval Petroleum Reserve No. 1, Elk Hills, Calif.

The committee has previously received a detailed explanation by Navy witnesses, corroborated by representatives of the Standard Oil Co. of California in support of the program which would result in a net increase of 18,000 barrels of oil per day over the present daily production of 6,200 barrels from Naval Petroleum Reserve No. 1, Elk Hills, Calif.

The committee recognizes that the primary responsibility of the Navy in administering naval petroleum reserves is to keep as much oil as possible in the ground rather than produce that oil. All of the witnesses who testified before the committee on the immediate problem have assured the committee that unless this increase in production

is accomplished we will lose substantial amounts of oil every day, which oil will be forever lost.

The Navy witnesses have stated that this loss of oil would adversely affect not only the Navy's interest, but the interest of the Standard Oil Co. of California.

The witnesses further testified that since oil is being lost, the increased production which has been recommended in order to prevent and curtail that loss would be entirely in keeping with the obligations of the Navy to practice conservation of this oil in this field.

With this brief background, I would like for the Secretary to advise the committee of his viewpoint in this particular matter, and since this is the first time that the new Secretary of the Navy, Mr. Anderson, from Texas, has appeared before us, I want to say that the committee is delighted to have you appear before us this morning, Mr. Secretary.

You come to us with the highest recommendations and we have heard many wonderful things about you: your background, your career. We want you to feel that this committee at all times stands ready to work with you and cooperate in the fullest degree for the benefit not only of the Navy but of our country.

We want you to feel free to call upon us at any time for any assistance that we might give your Department, that relates to the overall picture of our national defense.

STATEMENT OF HON. ROBERT B. ANDERSON, SECRETARY OF THE NAVY

Secretary ANDERSON. Thank you, Mr. Chairman.

I would like, of course, to express my appreciation for the kind introductory remarks of the chairman, and to say to you that I have learned already that there is a great tradition of cooperation between the Department of the Navy and this committee, and I can assure you that we will do our utmost to maintain that tradition of cooperation, and that you will have the full and complete cooperation of the office of the Secretary.

I have no prepared statement, Mr. Chairman, and if it meets with the pleasure of the committee, I would like to first express my opinion with reference to Naval Petroleum Reserve No. 1, which is the Elk Hills properties.

The committee, of course, knows the recommendations which have been made by the technical men of the Navy and those of the advisory committee. Essentially the recommendations amount to the fact that because of the floodwaters or the underground waters which are coming in on the north flank of the Elk Hills property, they are fearful of the entrapment of some oil, unless there is an increase in the production of the total fluids from the north area, or flank, of the field.

I have read during the past several days with considerable interest the report of these gentlemen and I have had the pleasure of talking with them about it in order to explore the possibilities of whatever other means might be taken in order to conserve the oil that is in the Elk Hills properties. As the committee knows, the pressure is falling on the south point of the reserve. I have discussed with the members of the committee the possibilities of salt water injection on the south end of the field in order to stabilize as nearly as possible the pressures over the entire field. The problem essentially seems to be that the

field is not susceptible of a salt-water drive, which is a secondary method of recovery which is quite widely used in some areas, because of the diverse permeability of the structure in which the oil is placed in this Elk Hills reserve.

From their report—and of course I have to accept the facts of their report as such—the sand is not permeable in the same relationship all the way through, but has a diverse permeability so that water injected into it for the purpose of making a uniform flow of the oil toward a given point doesn't result in the desired result of thus forcing the oil into a common pool, but further increases the possibility of entrapment of petroleum.

Their suggestion is that we drill 36 additional wells along the north flank in order to remove as much fluid as possible. The ratio of oil to water is about 2 barrels of water to 1 barrel of oil.

The suggestion which I would like to make to the committee is made in the light of the fact that the philosophy of the petroleum reserve is that of conserving as much of the oil as possible in the ground in the natural reservoir.

The CHAIRMAN. Of course, that is clearly the intent of the Congress.

Secretary ANDERSON. Yes.

The CHAIRMAN. When we passed the law originally, and I think of President Taft, when he set up this Petroleum Reserve No. 1.

Secretary ANDERSON. Yes, sir.

The CHAIRMAN. But if the situation has developed whereby we are losing the oil, then to increase the production is really a matter of conservation. It is better to get it now than to lose it forever.

Secretary ANDERSON. That is entirely correct, Mr. Chairman; and to that end I think that there ought to be begun a conservative drilling program along the north flank.

The CHAIRMAN. Of the Shallow Zone.

Secretary ANDERSON. Of the Shallow Zone only.

The CHAIRMAN. And keep intact the Stevens Zone where we can really conserve and hold in the ground the oil that is there.

Secretary ANDERSON. Yes, sir; I am talking only to the Shallow Zone.

The CHAIRMAN. Yes.

Secretary ANDERSON. And not the Stevens Zone. I would suggest that we begin a conservative drilling program along the north flank of the Shallow Zone, with this sort of an idea: that we would dig 1 or 2 wells in each one of the fault areas, proceeding progressively from one fault area to the other, in order that we could have a constant evaluation of how much good our drilling is doing, so that we would not necessarily project a program that had absolute rigidity, but we would be guided by the results in each of the Fault Zones as to how much good we were accomplishing.

That, basically, is what I would think would be a sound approach to it.

Now, as far as the Stevens Zone is concerned, I would simply suggest to you that we leave the Stevens Zone intact.

Mr. VINSON. Mr. Chairman, may I ask a question?

The CHAIRMAN. Yes, Mr. Vinson.

Mr. VINSON. Following your line of thought, as to the conservative drilling, can you elaborate a little and tell the committee what you would term "conservative drilling" and why it is necessary now, the

Engineers say, to construct 39 wells in that area. Approximately what length of time would you think would be conservative to put your 39 wells up in that section of the reserve?

Secretary ANDERSON. Mr. Vinson, if we would start with one drilling rig, we could dig two wells per month. It would be my suggestion that we dig these wells or that we space them, say—just for example—two in each of the fault zones, so that we might get some idea of the good we are accomplishing in each of the fault areas.

Mr. VINSON. Now——

Secretary ANDERSON. Then we would have a basic information which would be much more reasonable, in my judgment, to dictate the ultimate number of wells that might be required to remove a sufficient amount of fluids to effectively save the oil that would be entrenched.

Mr. VINSON. So, as you go along in a conservative manner, it might develop and the engineers might decide from the information they get as a result of the drilling that it will not be necessary to continue to drill the 39 wells?

Secretary ANDERSEN. It could very well, and I think we ought to have a program of some flexibility.

Mr. VINSON. That is right; exactly.

Secretary ANDERSON. Which is the reason for suggesting a rather modest approach to it.

Mr. VINSON. Now, is that same policy going to be followed on the migration of the oil out of the reserve, in the other end of the reserve, where you are going to drill three wells?

Secretary ANDERSON. If I follow your question entirely, Mr. Vinson, I think continuing study ought to be given to the possibilities of injection on the south end of the field in order to stabilize the pressures there. Frankly, the engineers who have examined the properties have evidenced some doubt as to wherher or not you could inject enough fluids to accomplish stabilization.

I don't know whether at this point we could or not, but I think continuing study ought to be given to it, with the idea of attempting some stabilization if it seems to be feasible economically.

Mr. VINSON. Mr. Chairman, may I ask the Secretary a few questions?

The CHAIRMAN. Yes.

Mr. VINSON. Mr. Secretary, will you give the committee your philosophy and your views with reference to a general policy, excluding anything about tidelands, in regard to oil reserves such as this?

Do you think it was a wise thing and a proper thing that the Government have done what President Taft did, and do you look with favor upon that policy of setting aside areas as reserves and trying to keep them in the ground?

Secretary ANDERSON. Mr. Vinson, basically I would regard all of the produceable oil in the United States as a part of the national reserve for national use in times of an emergency.

Mr. VINSON. Well, that is true of everything else in the United States.

Secretary ANDERSON. Yes; it is true of every type of thing.

Now, at the same time, there is no argument whatsoever that the best reservoir for the storage of oil is the natural reservoir which is in the ground. And, on these lands which are publicly owned, I have

no quarrel with the notion, with the idea that certain of them should be withdrawn; that they should be explored; that they should be put in a condition of produceability, and that they be regarded as a margin, we shall say, of safety for national-defense purposes.

Mr. VINSON. Well, then, to sum it up this way: Then you find yourself in general accord with the philosophy and the policy that has been announced by Congress from 1912 down to date in regard to conserving this oil in the ground?

Secretary ANDERSON. Yes, sir.

Mr. VINSON. And that you will oppose vigorously any effort to exploit the field, to take the oil out of the ground. You want to keep it in the ground.

Secretary ANDERSON. That which we are maintaining as a produceable reserve for times of emergency I think should not be exploited.

Mr. VINSON. Now, for the record, Mr. Chairman, I hope you will let me read a little historical background. I want this in the record. Then I want to ask one question of the Secretary and then I am through. I want to read this for the record. [Reading:]

President Taft, by Executive order dated September 27, 1909, withdrew certain public lands from entry in California and Wyoming to preserve them for future Government needs. The authority of the President to thus suspend the operation of laws enacted by Congress permitting acquisition of lands in the public domain was questioned. Although not sharing this view, President Taft requested the Congress to confirm this authority in the President, and Congress favored this request by the passage of the act of June 25, 1910, the so-called Picket Act (36 Stat. 847). President Taft, thereupon, by Executive order dated July 2, 1912, confirmed the withdrawal which he had earlier made by the order of September 27, 1909.

President Taft's two withdrawal orders did not mention the Navy nor did they expressly allocate any of the lands for the benefit of the Navy. By Executive order dated September 12, 1912, however, naval petroleum reserve No. 1 (Elk Hills, Calif.) was created, but the Navy had no power in respect to the reserves. Because of the inability of any agency of the Government to deal with the drainage problems in the reserve, an amendment was made to the Navy Appropriation Act for the fiscal year 1921, and as finally approved on June 4, 1920, was the charter of the Navy's powers with respect to the reserves for 18 years until amended by act of June 3, 1938 (c. 851, 52 Stat. 1252).

The unit contract between the Standard Oil Co. and the Navy was entered into on June 19, 1944, under the authority of the act of June 17, 1944 (c. 262, 58 Stat. 280, 34 U. S. C. 524), which further amended the act of June 4, 1920, as amended by the act of June 3, 1938.

The first recorded statement of a naval policy relating to conservation of oil in the ground in the naval petroleum reserves was made by the Secretary of the Navy in a letter dated June 2, 1915, addressed to the Attorney General, in which it was stated:

"In reply to your letter of June 2, 1915, in regard to policy that this Department advocates in regard to the naval petroleum reserves, you are informed that this Department considers that it is of the utmost importance that there be retained under Government control a proven oil-bearing area that may be reserved for the use of the Navy, with the oil remaining underground in the natural reservoirs of the earth protected from loss by fire and evaporation, and stored without cost, until sometime in the future when the reduced production and increasing price of oil render it advisable to produce oil for the Navy from this area."

The above-quoted policy remained unchanged throughout the years to the passage of the act of June 17, 1944 (34 U. S. C. 524). In Report No. 1529 on H. R. 4771, May 29, 1944, the Committee on Naval Affairs, House of Representatives, stated:

"The central purpose of the bill is to clarify and define the powers and authority of the Navy Department in the administration of the 4 petroleum and 3 oil-shale reserves heretofore set aside for the use and benefit of the Navy.

"The Navy Department's position has been that its powers must be commensurate with its responsibility for the carrying out of the congressional policy to conserve the Government's oil in the ground."

In Senate Document No. 187, May 2, 1944, entitled "History of Naval Petroleum Reserves," submitted in connection with S. 1773, it was stated:

"The Navy's basic policy with respect to the reserves is now, as it has been in the past, that there shall be the maximum conservation of oil consistent with the needs of the national military and naval security. The Navy has regarded itself as charged by the Congress with the responsibility for maintaining its present holdings of oil lands as a reserve of oil in the ground and for restricting the production of oil to those occasions when it is vitally required."

The aforementioned policy was restated in the unit plan contract of June 19, 1944, between Standard Oil and the Navy in which the recitals state in part:

"(6) (d) The unit plan of development and operation as set out herein will:

"(i) afford Navy a means of acquiring complete control over the development of the entire reserve and the production of oil therefrom in order that Navy may protect the reserve and conserve in the ground all of Navy's share of the oil in the reserve as well as a substantial portion of Standard's share of oil in the reserve.

"(iii) place the reserve in a condition of readiness whereby it will be able promptly to produce oil in substantial quantities whenever the strategic situation of the United States in the future may so require."

Now, Mr. Secretary, I want to ask you this question——

The CHAIRMAN. Before the gentleman from Georgia asks his question, the Chair would like to state at this point for the record that he is very happy that the gentleman from Georgia has taken time to read this brief but rather clear history of the background of this problem, and through all these years the distinguished and able former chairman of this committee, Mr. Vinson, has lived with this problem. He has been a faithful watchdog and has jealously guarded at all times the Government's interest in these reserves.

And I surmise the reason he has taken these few minutes this morning is that he is looking ahead into the future, even after he leaves Congress and after he shuffles off this mortal coil, he wants to make it clear and have the record for other men who shall follow us in the years to come to see what the clear intent and purpose of the Congress is.

I think I owe that to the gentleman from Georgia, and that the country is indebted to you. I think I have read your mind.

Mr. VINSON. Don't soften me up too much right now.

The CHAIRMAN. But I think I read your mind.

Mr. VINSON. I think it is highly important for the Secretary, who probably is not so familiar with this as some of us are, and the other members of the committee to sort of get a little background of this whole situation.

Now, Mr. Secretary, this is the question: Now, you bear in mind what we were doing, and what was in the mind of Congress. Now, my question for the record is this:

Mr. Secretary, is the proposal now to increase production 18,000 barrels a day in accordance with the policy heretofore announced by the Congress to conserve the oil in the ground?

Secretary ANDERSON. First, I should like to say to the distinguished Congressman that I will be most happy to give you my reassurance that the congressional policy which you have outlined will be the policy which the Navy will continue to follow.

In direct response to your question, I think it is consistent with the position which the Congress has traditionally taken, because in view of all of the information which we have at hand we do face the very present possibility of oil being entrapped by the encroachment of salt water, but in order to as nearly as possible subscribe to the policy of conservation and the nonexploitation of these reserves, which have

been established for emergency purposes, I have suggested that we go about it very modestly and with a great deal of flexibility and that we utilize only one rig and that we use the rig for the purpose of drilling in the various fractured zones in order that we may have some measurement of the results of our efforts, and that we will know how far we should go consistent with the policy of conservation that the Congress has traditionally established.

Mr. VINSON. This is off the record, Mr. Chairman.

(Statement off the record.)

Mr. VINSON. With the assurance of the carefulness and the conservative manner that you are going to proceed, and with your recorded statement that you believe in the philosophy announced by Congress, why, it might be splitting a hair to deal with it from the other angle instead of just from the angle that you might classify as conservation.

Now, I would like to ask one more question, and then I am through, Mr. Chairman.

There is a little conflict in the record—and this is to Captain Meade—as to who pays for the construction of the wells. One place in your statement you said the Navy; and it would cost about $1.5 million.

Then in another portion of it it is intimated that when the account is balanced between the Standard and the Government, why, then the Standard would pay for the one-third of the construction.

Now, just let's clear that up.

Captain MEADE. Yes, sir.

My understanding of this situation, Mr. Vinson, is that these wells would be interpreted to be drilled for the purpose of being produced.

Mr. VINSON. What?

Captain MEADE. They are being drilled for the purpose of being produced.

Mr. VINSON. That is right.

Captain MEADE. In that case, I have been advised that the contract means that the cost shall be shared in accordance with the percentages of oil received now by the several parties.

Now, at the present instant the division of the production of those wells is in the proportion of one-ninth to Standard Oil of California and eight-ninths to the Navy. There are certainly grounds for asserting that Standard must share one-ninth of the cost therefor.

There may be grounds—and I need further advice on that—as to whether they should be asked to share one-third of the costs.

Mr. VINSON. All right.

Captain MEADE. Because——

Mr. VINSON. Then you have to go before the Appropriations Committee and you have to get a clearance from the budget to get some money for the construction of these wells?

Captain MEADE. Yes, sir.

Mr. VINSON. Have you cleared it before the budget? Have you asked the budget for a clearance on it?

Captain MEADE. They have cleared, Mr. Vinson, the sum of $500,000 for us to use to begin the drilling of these wells, subject to the consultation and approval of this committee.

Mr. VINSON. All right.

Now, Mr. Secretary, this committee is going to be constantly kept advised by you, will it not? If you find you have to go up to the 39

wells, you will go ahead, have the authority to go up to 39 wells. But if you have to go beyond that why you are going to come back up here and talk to the committee and tell us what the engineers find, and you are going to try to hold it down and keep it in the ground as much as possible; is that it?

Secretary ANDERSON. Mr. Vinson, we are going to go about it as modestly as possible. We are going to evaluate our work constantly. We will advise the committee of the results of that evaluation. It will be our deliberate policy to conserve as much of it in the ground as possible, and we will not only ask but come to seek the counsel of the committee from time to time.

There is one other point I would like to make, Mr. Chairman, if I may.

The CHAIRMAN. Yes, sir.

Secretary ANDERSON. I should like to be very clear on the point that Congressman Vinson raised about the authorization of a fixed number of additional barrels of oil to be produced. I would not like to be in the position of suggesting any fixed amount of oil to be additionally produced, but rather, to suggest that we simply drill these additional wells for the purpose of the withdrawal of total fluids, which is estimated to be in the neighborhood of 2 barrels of water to 1 barrel of oil, and that the amount of oil that is produced will be this inflexible amount that we find may be necessary in order to prevent the entrapment by salt-water encroachment.

Mr. VINSON. Well, to carry that point out, you might have complate drainage, almost opening up of the field in its entirety.

Secretary ANDERSON. I mean it on the opposite side. I mean it the other way, sir.

Mr. VINSON. If you reach a certain point, you have to get a resolution through Congress to do that.

Secretary ANDERSON. Yes. I mean it the other way, sir. What I mean is we are not trying to get a large increase.

Mr. VINSON. That is right.

Secretary ANDERSON. We are simply saying that we will produce these wells which we will conservatively begin the drilling on and advise the committee as to what results we are obtaining from it, and as to what the program might be, because the problem as I see it is the protection of the oil in the ground.

Mr. VINSON. That is right. And you share and are in accord with that philosophy, to preserve the oil in the ground.

Secretary ANDERSON. Yes, sir.

Mr. VINSON. Now, I want to get this on the record:

Is that your opinion from an original standpoint, or is it your opinion because it has already been created?

Secretary ANDERSON. No; that is my opinion, because it is a good, sound national policy.

Mr. VINSON. All right. Now, I would like to ask the captain:

Captain, do you share that same opinion, that it is the right policy of the Government to try to conserve this oil in the ground?

Captain MEADE. I believe, sir, that when the reserves were established the conception was sound. As of today and under similar circumstances, knowing what we do today, it is my thought that we might not have done what we did, sir.

Mr. VINSON. Then you are charged with the administration of it and the adviser to the Secretary, yet you don't think it was on such sound grounds, if you had to start to do it from today?

Captain MEADE. May I say, sir, that having been charged with the responsibility of administering these reserves and since they have been set aside, it has been my duty and purpose so to administer them——

Mr. VINSON. That is right.

Captain MEADE. As to carry out to the fullest extent the policies of the Secretary and the Congress.

Mr. VINSON. Well, there is no doubt in my mind about that. But you know for a man to teach anything, he has to believe in it, rather strongly. And from what you have said, you are not so enthusiastic about these reserves as President Taft or Congress, or you wouldn't look with such favor on setting them aside. I just want it for the record. That is all I want.

Captain MEADE. I think I have to say that is correct; yes, sir.

Mr. VINSON. That is right.

Mr. BENNETT. Couldn't we have the reasons for our own edification?

Mr. VINSON. He just doesn't believe in it, just like I don't believe in a heap of things. You can ask him.

Mr. BENNETT. All right.

Could I ask you to what do you attribute your lack of enthusiasm for this program?

Captain MEADE. Well, I would like to say, sir, that I am very enthusiastic about the work that we are doing. I think that I have carried on my execution of this program with the greatest enthusiasm. I believe, perhaps in reply to your immediate question, sir—I think the question is a larger one than I am competent to attack. There are others in the Department and outside the Department who are in a much sounder and better position to evaluate these questions. I am very willing and happy to accept their opinions and to do my best to implement them in an engineering fashion to accomplish the results we all hope thereby to attain.

Mr. BENNETT. Nobody is being critical of you, at all. We all said we are happy about the work and effort you put forth. But you have indicated that you are not enthusiastic or not sold——

Mr. MILLER. Sympathetic.

Mr. BENNETT. Sympathetic to the program we have today.

Captain MEADE. Yes, sir.

Mr. BENNETT. And I think you have a duty to tell this committee of Congress wherein you have reservations about it.

Captain MEADE. I would like to say this, sir: What I have been meaning to say is this, that when President Taft created these reserves it was then proposed to set aside a supply of oil which would be sufficient to supply the entire Navy of that day for 25 years, and I think to that extent they did very, very well indeed.

At the present time, we have one developed reserve which could produce in time of war something like 150,000 barrels per day to start, just using round figures.

That is very important, and very valuable. We should retain it. We should use it only under emergency conditions. But the size of

the program I am administering today is not in any sense geared to the size of the demand for oil today and the size of the large commercial industry available today to supply it.

I, therefore, think that we are charged today with, in fact, the protection, administration and use, when needed, of a very valuable piece of property, but it is nevertheless in a position to supply only a very small percentage of the military demands.

We must rely and have to rely upon commercial industry to produce the greater part of our oil supplies in time of war.

Now, that is why I say that we would not, I think, attempt today to set aside a 25-year supply of oil for the whole Navy. It is a different concept. But since we do have this very valuable reserve, I agree that we have the duty of developing it and keeping it ready for the purpose intended, even though it will play a small part than had been hoped 25 or 40 years ago.

Mr. VINSON. Mr. Chairman——

The CHAIRMAN. That is all right.

Mr. Gavin, you have a question?

Mr. GAVIN. I haven't any suggestion other than the fact that I think the Secretary of the Navy should periodically submit to this committee, as the exploration proceeds, a report that we can see what the development is really producing and whether or not to continue it.

The CHAIRMAN. They do that.

Secretary ANDERSON. It certainly will be done.

The CHAIRMAN. They will do that.

Mr. VINSON. Mr. Chairman, may I ask the Secretary this:

Mr. Secretary, under the unit contract you have the right to fix the amount of production from the field, and the contract also requires that you discuss these matters, but you don't have to come, necessarily, into agreement with the committees. Now, you meet the requirement by submitting the facts, and from the facts that you have you are going to announce a policy with reference to an increase of production for certain purposes as set out in the engineer's report; is that correct, sir?

Secretary ANDERSON. Yes, sir; it would be our suggestion that we simply began, as I said before, with 1 rig, that would allow us to drill 2 wells per month; that we would drill those 2 wells for the purpose of determining the effectiveness of the total fluid withdrawal in preventing the further encroachment of salt water into the oil-producing zones; that we would come and report to the committee the results that we obtain from this drilling operation along the various fractures in the field, and from the information that we then have we would come in and suggest to the committee what course of action we thought was proper from there on out in maintaining the possible conservation practice.

Mr. VINSON. Mr. Chairman, I think this should appear in the record, that last August the Truman administration, through Secretary Kimball, submitted the question to the committee and a hearing was had, and this is one of those things that the present Secretary of the Navy fell heir to. I don't want anyone to say that after getting here in 2 months, why, he is opening up Elk Hills, because that is not the fact.

Secretary ANDERSON. No, sir.

Mr. VINSON. That is not the fact.

While he has the responsibility and it is not necessary for this committee to take any affirmative action, from all the facts that have been submitted here—and I regret it, but you have to be practical—it looks to me as if you have to draw a little bit more oil out of Elk Hills than we were doing under the previous shutdown to 6,000 barrels.

If the Secretary, as far as I am concerned, wants an expression from me or from the committee, I will have no hesitancy in going on the record as trying to carry out in a conservative manner the recommendations of our engineers.

The CHAIRMAN. I think that that perhaps makes our decision or conclusion of this committee unanimous.

The Secretary of the Navy has fully discharged his obligation by consulting with us, and Captain Meade has been forthright and frank.

Mr. VINSON. Yes, sir.

The CHAIRMAN. And it is good that the Navy engineers, along with the engineers of Standard, have reached a unanimous agreement and are one in their recommendation, that in order to save oil that will be irretrievably lost that we will have additional drilling at this time in the shallow zone.

Without any objection from the committee——

Mr. DURHAM. Mr. Chairman.

The CHAIRMAN. We have four reserves, and we must finish them this morning. I don't want to cut the gentleman off——

Mr. DURHAM. Just one question.

The CHAIRMAN. If there is no objection, I think——

Mr. DURHAM. I just want one question, Mr. Chairman.

The CHAIRMAN. All right.

Mr. DURHAM. Mr. Secretary, does this have to be submitted to the National Security Council for recommendation?

Secretary ANDERSON. I understand not, sir.

Mr. WICKERSHAM. Mr. Chairman.

The CHAIRMAN. All right, go ahead.

Mr. WICKERSHAM. Mr. Secretary, in view of the Secretary of Defense's statement that he felt many of our plants and authorities and Government holdings should be disposed of, title revert to industry, does he hold the same view as you do on this matter?

Have you talked with him?

Secretary ANDERSON. I have not talked with him, sir. I am sorry. I can't answer it. I have not discussed it with Mr. Wilson.

Mr. WICKERSHAM. I would like to know.

Secretary ANDERSON. I would suggest he write you.

Mr. SMART. I might state, Mr. Wickersham, the Secretary of Defense has no responsibility whatsoever. This is a direct responsibility of the Secretary of the Navy alone, as a matter of law.

Mr. VINSON. And I hope—off the record.

(Discussion off the record.)

The CHAIRMAN. So without this objection, this committee I think is satisfied fully, Mr. Secretary, with the decision that you have made, or conclusions that you have reached.

Secretary ANDERSON. Thank you, Mr. Chairman.

The CHAIRMAN. And so far as we are concerned, you can go ahead with your development; you and the captain.

Secretary ANDERSON. Thank you, sir.

The CHAIRMAN. Now, then, members of the committee, I would like to call your attention to a little problem we have with Naval Petroleum Reserve No. 2, at Buena Vista, Calif.

The Navy submitted, under its obligation to consult this committee, a proposal to gain a greater recovery of oil in certain portions of this petroleum reserve through the use of waterflooding. It is a minor problem. I am confident that Captain Meade can give us a very brief explanation which will be entirely satisfactory for the purpose of this consultation.

Captain MEADE. Yes, sir.

On January 28, 1953, the Assistant Secretary of the Navy addressed to the chairman of your committee a letter concerning a waterflood project on certain lands in Naval Petroleum Reserve No. 2, Buena Vista Hills, Kern County, Calif. With that letter he enenclosed a pamphlet entitled "Request for Approval of Fixed Royalty in Connection With Water Project, Buena Vista Front Field, Naval Petroleum Reserve No. 2."

A copy of that letter and of the pamphlet has been supplied for each member of your committee, and since those two documents contain in detail the proposal which I would like to discuss today, I will attempt to summarize briefly what the proposal is, and then endeavor to answer any questions you may have.

The General American Oil Co., of Texas, is the present holder of leases on certain Navy lands within this reserve. However, only land shown on a certain shaded section on a map, in this enclosure, are involved in the present proposal and they aggregate 1,280 acres.

D. D. Feldman operates an oilfield engineering firm doing business under the name of D. D. Feldman Oil & Gas. General American and Feldman have proposed that a secondary recovery project be instituted on the General American lease in question in an effort to increase the ultimate recovery of oil from these leases.

The secondary recovery mechanism would be a waterflood project whereby water is injected into the oil-bearing formation and if successful would lead to the recovery of oil which would otherwise remain in the porous spaces of the formation.

The proposed project is divided into three phases. Under the first phase Feldman would conduct certain coring operations on the leases in question to obtain information as to the feasibility of the project. If the results of the coring are satisfactory, Feldman at his election then proposes to institute a pilot or experimental waterflood project on a selected 100-acre tract.

Finally, if the results of the pilot flood prove satisfactory, he at his election will then undertake the full-scale waterflood project.

Now, in brief, he is in this position—he wants to try to see if he can improve the financial position of the lessees and of the Government in this place. It is an experimental thing. The lessee has asked for an inducement of a modification of the terms of current lease.

The royalties presently call for a sliding scale, going from 12.5 percent up to about 65 percent. The waterflood project, if successful, would carry us into the area of large royalties, but those large royalties would prohibit the project. In other words, there wouldn't be enough money in it for the operator to do the job. So, in order to encourage him, he has asked the Secretary to approve a flat royalty of 14 percent, rather than the 12.5 percent now being paid.

It is necessary to consult with the committee in order for the Secretary to be in position to give that approval.

Now, it isn't asked now. It is something for the future. He wants to do the experimental work first, but he doesn't want to start unless he has the assurance that if he is successful he may obtain the benefit of his experiments.

We have recommended that we give him advance approval of our willingness to change the royalty rate, and we ask for your concurrence in this consultation.

The CHAIRMAN. How does the committee feel about it——

Secretary ANDERSON. Mr. Chairman, may I make this statement?

The CHAIRMAN. Yes, sir.

Secretary ANDERSON. I did not have, until yesterday, an opportunity to look at this problem with reference to the waterflooding. As a consequence, I could not give the committee any assurance that the proposed royalty rate is the proper rate, nor could I give the committee assurance as to what the costs and the possibilities are with reference to the waterflooding project. As a consequence, I would like to respectfully suggest that the committee give consideration, if it wants to, to the approval of the principle only, because I would not be in a position to say to you that I think we have a proper royalty rate, and I would——

The CHAIRMAN. I believe you are an honest man. You are being very careful not to get out on the limb. I think you are very wise in asking us to approve of it only in principle.

Mr. VINSON. Mr. Chairman, we don't have to approve of it. He has complied with the law, just laying it before the committee. Now, the Secretary has made in my mind such a fine impression on how he is going to administer these things that it is all right with me. He has met every requirement of the law by just laying it before the committee. We don't have to pass yes or no on it. It is up to the Secretary.

The CHAIRMAN. Any objections to No. 2?

Mr. VINSON. Whatever the Secretary does is satisfactory to me.

The CHAIRMAN. You have consulted with the committee. So, go ahead on No. 3.

Secretary ANDERSON. I want to make clear we are not asking here for this 14-percent royalty. I don't know——

The CHAIRMAN. I am very glad you got it on the record there. We understand your position thoroughly.

Now, gentlemen, naval petroleum reserve No. 3, Teapot Dome, Wyo. It is completely shut in, and no exploration is going on at all there at the present time.

Therefore, no committee action is required at this time. So, we will move to Naval Petroleum Reserve No. 4, Point Barrow, Alaska, which is quite important and which involves considerable sums of money.

I think that we can dispose of this fairly quickly. But we have a whole hour here.

I wish to make just this brief statement. The Navy began exploration for petroleum in this reserve No. 4, at Point Barrow, Alaska, in 1944, and has spent in excess of $50 million in its petroleum explorations over a very wide area of land which was set aside from the public domain.

I am advised—and some of the members of this committee, including myself, have visited Alaska on different occasions—keeping in mind the isolated area in this reserve, that neither petroleum nor gas has been found in commercial quantities, in spite of the fact we have spent more than $50 million.

Of course, all of us recognize that Point Barrow is icebound almost 11 months out of the year, and that, if we should find substantial quantities of oil in that area, we would be confronted with a major problem in trying to get the oil out.

Pumping in subzero weather. A pipeline would probably cost $100 million, just to get the oil down to Fairbanks, and none of us are naive enough to believe that we would have the use of such facilities beyond the first day of any possible hostilities with Russia. This committee has taken no formal action with reference to continued exploration of this reserve. However, I am confident that I reflect the overwhelming opinion of the committee when I express serious doubt as to the advisability of continued exploration by the Navy in petroleum reserve No. 4.

An appropriation request in the amount of $9.7 million is included in the Navy's fiscal 1954 program. It looks to me as if this is a good place to save about $10 million for this year, plus whatever may have been programed for fiscal 1955. There is also some salvage in the $6 million in equipment we have there and the $13 million in current contracts which should be canceled and renegotiated.

I would like the Secretary's viewpoint on this matter, but I would first like to recognize Mr. Gavin of Pennsylvania, from a great oil district, where they produce, in his opinion beyond the shadow of a doubt, the best oil in all the world. Mr. Gavin, from Pennsylvania, a great oil-producing district, has been with me on trips to Alaska, and knowing his intense interest in the whole overall problem and particularly the time and study that he has devoted to this particular reserve, I would like to give Mr. Gavin an opportunity to be heard, because I think he can give us some valuable information.

Mr. Gavin.

Mr. GAVIN. Well, Mr. Chairman, I thank you for this opportunity. It is a matter in which I have been greatly concerned for a considerable time. And I have prepared my statement here so that it will briefly cover it and give you the picture and then let our good friends maybe defend their position.

Now, I think I should begin by telling the committee that the daily production of oil in the United States today is 6,487,000 barrels. Also, Canada is producing 188,000 barrels a day. Mexico is producing 207,000 barrels a day, and the world production is 12,153,000 barrels a day.

Now, I might say to the committee that some several years ago the Army had the Canol project up in the Canadian wilderness that cost the American taxpayers $138 million. And I might say that after this project was completed there was a dedicatory ceremony, and about 10 days later the whole project was abandoned—and Nature took over. It was finally sold for scrap, written off, a complete loss, with the exception of a few hundred thousand dollars received from the sale of the equipment and refinery.

After the Canol failure by the Department of the Army, the Navy decided to get into an oil-exploration program—petroleum reserve

No. 4 at Point Barrow, Alaska. In a letter from the Department of the Navy under date of January 14, 1953, they state, and I quote:

When the Canol project in Canada was known to be a failure, the War Department was anxious to find a replacement project which could be relied upon to furnish the military with petroleum products in Alaska. Capt. W. C. Latrobe, then in the Bureau of Ships, and Rear. Adm. Ben Moreell, Chief, Bureau of Yards and Docks, were persuaded that naval petroleum reserve No. 4 offered the best chance of finding oil in Alaska. Rear Admiral Stuart (DNPR) concurred in this view, as I believe also did Mr. W. E. Wrather, Director, U. S. Geological Survey. Decision to activate the reserve seems to have been made by the then Secretary of the Navy [Knox] after discussion with the CNO and with the knowledge and consent of the President.

Now, I want to point out to the committee that the accumulative status of costs up to August 31, 1952, from figures submitted to me, is:

1946	$965,000
1947–50	9,600,000
1947–51	14,600,000
1950	3,000,000
1947–52	11,000,000
1947–53	6,100,000
1953–54	7,500,000
Total appropriated to date	52,765,000
Government-furnished materials without exchange of funds (estimated)	12,000,000
Total funds and materials to date	64,765,000
Unexpended balance, Aug. 31, 1952	−13,480,926
Inventory of Government-furnished materials, Aug. 31, 1952 (estimated)	−6,000,000
Total cost of program to date	45,284,074

Also, it was stated in the Navy Department letter under date of January 14, 1953, and I quote:

Under current plans, and according to the recommendations of the Advisory Committee, a full program through calendar year 1955, assuming negative results, will be necessary for a reasonable evaluation. The figure of $50 million includes the funds for operations during the calendar year 1953. Thus, estimating $10 million per year for 1954 and 1955 and $5 million for closeout in 1956 gives an estimated minimum future cost of $25 million.

In June 1951, Arctic Contractors, Inc., estimated that a 16-inch line from Umiat to Valdez could be constructed for $65,000; however, it seems possible that actual costs for such a line might be as much as $100 million.

Now, I want to point out to the committee an amount approximating $10 million will be requested for fiscal year 1954. A point relating to this which I think will be of interest to you is that, heretofore, the appropriation for Petroleum Reserve No. 4 has been carried as a separate item and therefore easily identifiable item. In fiscal year '54, however, it is planned that the appropriation for this reserve will be carried as part of the general appropriation for all petroleum reserves and may, therefore, be somewhat less easily identified. The designation of the appropriation will be "Naval Petroleum Reserves."

Consulting with Captain Meade, he states that that is not a fact. However, I am making it a matter of the record, so whether he is right or not, it will be called to the attention of the Appropriations Committee so that they know it is in there somewhere.

If it is identifiable, fine; if it isn't, they can look for it.

Now, I might say to committee from information provided me that the results of the exploration have been virtually nil. It appears that the geology of that whole area indicates the possibility of oil in exploitable quantities. Actually, some small amount of oil has been found and some gas wells have been drilled. Naturally, the question arises as to whether, if oil is found, how it can be transported from the area.

The Navy has been carrying on experiments as to the feasibility of the construction of a pipeline which, I would gather, could not be less than 500 miles in length and would probably be much longer depending on the particular route taken. The experiments have indicated that it may be possible to lay the line, at least for a portion of its length, about 3 or 4 feet below the surface of the ground and cover the pipe completely both below and above with tundra, the mosslike vegetation of that part of Alaska.

It would not appear, however, that regardless of the feasibility of the tundra insulation for the northernmost part of the line, there is no tundra as the line progresses southward and some other form of insulation would be necessary for this part of the line.

In any event, such a line would, in my opinion, be fabulous in cost since, in addition to the consideration of temperature, it would probably be necessary to cross the Yukon River and two mountain ranges.

Now, I might say to the committee that the report of the Special Subcommittee on Public Works in Alaska, with Mr. Porter Hardy, chairman, August 31 to September 10, 1951, states in part that—

> It should be mentioned, at this time, that the subcommittee is hard put to understand the need for the tremendous expenditures this project necessarily entails. Here we have a diligent search for petroleum being conducted in one of the most inaccessible areas in the Western Hemisphere. There are no roads, railroads, or transportation available within hundreds of miles. Point Barrow is at the northernmost tip of Alaska on the shores of the Arctic Ocean, with sealanes open for only 2 months a year, at the most. The only means of access is by air, and this from Fairbanks, 500 miles distant and over some of the roughest and most desolate terrain in the world. Even if vast petroleum deposits are discovered, the problem and expense of transporting the fuel to transportation terminals is one that staggers the imagination.
>
> The subcommittee is frank to admit that it has not made an adequate study of the entire problem, but believes that this most certainly must be done by the proper authorities before further appropriations are authorized for this project.

The Seventh Report of the Preparedness Subcommittee of the Senate Committee on Armed Services, following an investigation August 31, 1951, to September 10, 1951, states in part:

> During the war the Navy instigated an exploration of this petroleum reserve, using military personnel for the purpose. Since the war it has continued this project under a civilian contract. Approximately $30 million has been expended on this project and it is estimated that an additional $20 million will have been expended by December 31, 1953, when it is planned to complete the exploration work.
>
> For the fields to have any commercial significance they must be of vast size because of the difficulty of producing and marketing the oil in this area.
>
> It is the Navy's belief that it is entirely feasible to construct a pipeline from this area to the south if the amount of oil discovered is sufficient to make its exploitation commercially attractive.
>
> The construction of the pipeline in the event a major oilfield is discovered will cost several hundreds of thousands of dollars—

in my opinion several millions of dollars, as the Navy's estimate is between $65 and $100 million—

and present major engineering problems. These, however, are deemed to be surmountable.

The Navy is extremely cautious and conservative in any predications they make concerning the oil potentialities of this area. Prior to the time the subcommittee was in Alaska no significant discoveries had been made. However, we are informed that the Navy had utilized the services of expert geologists and petroleum specialists, and they all believe that the signs point to the existence of considerable oil in the area.

Two minor oilfields and one gas field had been discovered prior to the subcommittee's visit. The base camp at Point Barrow is heated by natural gas from the field—

I might say to the Captain that that is pretty expensive heat, on the basis of today's market; that the only heat we got up there has been the gas to heat the camp up there.

Shows of oil have been found in every well which has been drilled. However, during the subcommittee's visit, a well of significant size producing 550 barrels per day was brought in at Umiat.

The biggest well you brought in was a well with a 250-barrel test; wasn't it?

Captain MEADE. I believe the Senate committee is correct, sir.

Mr. GAVIN. Yes.

These successes have greatly encouraged interest in the project, and while there is still no certainty as to the existence of a major oilfield, it is the belief of all persons talked to by the subcommittee that the chances are excellent that such a discovery will be made.

Now, I might say to the committee that it is my firm conviction that this exploration project should be terminated at once, as I understand the harbor at Point Barrow is open but 6 weeks of the year, and it is questionable actually how much oil and gas they have found there. They say they made tests and they have so much, but that is still questionable.

The cost of a pipeline to transport the oil, if oil should be found, would be prohibitive. There is no economic justification to develop the area as there is no ready market for the oil and even if substantial quantities, reservoirs of oil, should be found, transportation difficulties enter into it. Even if these difficulties could be worked out, what would you do? You would lease it to private property and private enterprise would come in and produce the oil. So let private enterprise carry on their own oil explorations. Let's not ask the American taxpayer to exploit the reserves and then come in—if private enterprise is interested, why not let them carry on the exploration, rather than carry it on at this tremendous cost to the American taxpayer. It is my opinion the Armed Services should recommend to the Appropriations Committee that they should deny any further appropriations on this project, salvage whatever material can be salvaged, reclaim the unexpended portion of the appropriation to be used for more important phases of our national-defense program.

Now, we got up there about—here we have unexpended $13,480,000 of which there is an inventory of $6 million. Well, they might say that that is already allocated. Certainly there must be something in the contract that would give us an opportunity to review these contracts to ascertain whether or not they could be canceled out if the committee thinks that should be done, and reclaim some $7 million there and with the appropriation that has been requested for 1955 of $10 million, that would be a considerable saving.

Now, I asked the captain to give me a report or the minutes of the meeting of this 17th meeting of the advisory committee on this project. This is it. It is just about two pages.

The CHAIRMAN. I think——

Mr. GAVIN. It is just a paragraph. I think it is significant. I will get on as fast as I can.

But there is a lot of money involved here, and there might be a chance to become economy minded.

This advisory committee on petroleum reserves met in Denver in November of 1952. They say:

> An outstanding accomplishment of the committee was a statement of concensus of what further work is required to make a reasonable evaluation of the petroleum potentialities of the reserve and adjacent areas in the sedimentary basin north of the Brooks Range. According to present data, the committee agreed that for 6 to 10 wells principally to test the deeper pre-Cretaceous formations will be required for a reasonable evaluation.

Now, the $10 million that is asked for: Here is what it says. I presume this is the justification for it:

> A program for calendar year 1954 was discussed in general terms and principally to gain the advice of the committee concerning the advisability of a program of the magnitude to be accomplished within the budget requested for 1954. The committee expressed a unanimous opinion that the present request for funds for 1954 should not be reduced. Plans for operations during 1954 are to be developed at future meetings.

They didn't even develop any plans.

> Advisory opinions based on present information were requested of the members of the committee regarding continuation of exploration beyond 1954. These opinions, while not specific, indicated that if the balance of drilling tests give only negative results a drilling program through calendar year 1955, with close-out in 1956, might provide sufficient information to permit making a reasonable evaluation of the oil potentiality of NPR No. 4.

Well, spending $50 or $60 million, you ought to get some kind of an evaluation of that field.

Now, for the record, Captain Meade has furnished me through Comdr. J. B. Kackley some very definite information on actual results up there, which I will put in the record. if you should agree it should go in, where the Department of the Navy were fully informed with respect to the operation.

And then it gives the contractors. The contractors, some of them up there, are on a cost-plus basis, and then some on fixed prices and personal services per day.

Now, actually the Navy Department employees engaged in petroleum reserves activities in Alaska, and relating to Alaska: There are 16 in Alaska and 4 in the Seattle, a total of 20.

How many contractor employees are there? Presumably they would all be in Alaska, but some in Seattle. How many?

In Alaska, there are 305, and 12 in Seattle; or a total of 317 contractor employees.

They have tests or shows of around 900 or 1,000 barrels of oil. They have a showing of that. Tests indicate that. There is no actual production that could be guaranteed in that amount, but the test production shows around 1,000 barrels.

The reason I pointed out what the daily production is in the United States, of 6,480,000, is to show the trickle that that would be, to spend about $50 million to get that amount of oil.

Now, I just feel that—this has been going on since 1945. The oil experts and the geologists and other people have been up there now about 7 years. I think, if I am right, that they wanted to close out the program in 1946. As you said to me, Captain, they felt that they should drill a couple of deep-test wells up there to test the field further south and then close the whole thing out.

Well, even if you had reservoirs of oil up there, I don't know what you would do with it. It is in an inaccessible part of the world. How you would find a market for it, and how you could economically justify the continuation—I think they have done enough exploring up there, Mr. Chairman, and it is about time we did something about it.

The CHAIRMAN. The gentleman, I think, has made his position fairly clear. I gather from what he says he is "agin" it. I think, though, the committee would like to hear Captain Meade on this particular project of the reserves, or if the Secretary—if you have discussed it with him and he can give us the conclusions or recommendations, we would be glad to have them.

Secretary ANDERSON. Mr. Chairman, may I say that I am in substantial agreement with the gentleman from Pennsylvania, at least to the point that we would like to suggest to the committee that all operations in the Alaska field be suspended as of now, and that no appropriation be asked for in 1954.

The CHAIRMAN. That is wonderful.

Mr. BATES. Mr. Chairman.

The CHAIRMAN. Yes. The only question in my mind: I think we all feel pretty much the same way. The only question in my mind is to cut off right now and terminate the program sharply. Shouldn't it be done in an orderly manner?

Secretary ANDERSON. By all means, Mr. Chairman, I am advised there are no wells in progress.

The CHAIRMAN. That is right.

Secretary ANDERSON. And therefore, you would not be stopping any drilling operations. It would simply be a matter of the withdrawal of materiel, orderly withdrawal of people.

The CHAIRMAN. So you are not going to request from the Appropriations Committee further funds?

Secretary ANDERSON. No, sir.

The CHAIRMAN. At this time, for the project. We can then save the taxpayers this morning at least $9.7 million.

Secretary ANDERSON. Plus some additional money that would be salvaged out of the current year.

The CHAIRMAN. Plus some other money—recoverable funds.

Secretary ANDERSON. Yes, sir.

The CHAIRMAN. So I know that that is going to please Mr. Taber and perhaps will ingratiate this committee—put it in good standing with the Appropriations Committee.

Mr. JOHNSON. I would like to ask this question:

I notice on the list of those who have had to do with this, and advised on this, is Dr. Wrather. He is an international geologist, with a good international reputation, and if he recommends that, in my opinion, there must be something valuable there. While it does sound fantastic to spend all this money and have no specific results, I would like to have Captain Meade or the Secretary tell us, give us

a little background on why this kept continually going on. Was there reasonable prospect to think you could find a tremendous oil field there?

Captain MEADE. Sir, I can answer that question as "Yes;" there has been a reasonable chance of finding a tremendous oil field. There is still a reasonable chance of finding a tremendous oil field; when we stop, we must all understand that we have not completed the exploration and that it is still possible that someone else, ourselves or someone else, depending upon the national policy, of course, might find a very substantial oil field in that area.

Mr. JOHNSON. Now, one other question: Could I ask another question, if you are through with your answer?

Captain MEADE. Yes, sir.

Mr. JOHNSON. Now, Mr. Gavin presented the obstacles up there—the climate, topography, and the like. Are those obstacles insurmountable, in your opinion?

Captain MEADE. I think it is a matter of economics, sir, and if the discovery were large enough it could justify economically its development. Now, we have not found such a discovery.

Mr. JOHNSON. But there is still, in your opinion, good data that indicates that there might be a tremendous field, maybe as big as the one in Saudi Arabia, for instance?

Captain MEADE. Well, there is no indication, of course, that we have anything like the Saudi Arabia condition, sir, but I do say that we can't say today that there are not substantial quantities of oil in that field. We have not completed a reasonable evaluation of the field. But the completion of that reasonable evaluation takes us into an area where very deep wells are required.

It becomes a matter of judgment under today's conditions how far you should go.

Mr. JOHNSON. Just one last question:

Do you believe that, considering the fabulous amount we have invested up there in explorations, that it would be a good business principle to spend a little more to make the tests and the results more conclusive?

Captain MEADE. No, sir.

Mr. JOHNSON. You do not.

The CHAIRMAN. Mr. Bates, of Massachusetts, has been up there, and I think he served on the subcommittee that made this study, and I am sure that he could give us some valuable suggestions.

Mr. BATES. Mr. Secretary, isn't it true that these figures that have been related to us this morning do not include personnel cost, maintenance of the men, the pay and the clothing, food, and all that?

Secretary ANDERSON. I don't know, frankly.

Mr. BATES. Those are not included; is that correct?

Captain MEADE. They include everything, sir, with the exception of the military officers' pay. That would not be included.

Mr. BATES. I am speaking of the military personnel.

Captain MEADE. Military personnel pay is not included in those figures.

Mr. VINSON. Mr. Chairman, may I ask a question?

The CHAIRMAN. Wait a minute.

Mr. BATES. I have several questions on this.

I know there is an economic situation that is going to develop up there, because the Eskimos have abandoned their normal way of life. I think you understand that.

Captain MEADE. Yes, sir.

Mr. BATES. And it is one of the things that concerned us when we were making that trip. Up there, you see the kids eating candy bars, and blubber is something that is for the historical records. So there is going to be quite an adjustment made up there in that particular area.

Now, Mr. Secretary, I wonder if you read the report of the former Secretary of the Navy or perhaps it was an Assistant Secretary of the Navy, on this project?

Secretary ANDERSON. No, sir; I have not.

Mr. BATES. Did you read that, Captain Meade?

Captain MEADE. I have been familiar with this project in all its aspects for the last 2 years, sir.

Mr. BATES. Well, specifically, have you read that report of the Secretary of the Navy or the Assistant Secretary of the Navy—a report that was made by him personally in 1951, I believe.

Captain MEADE. Yes, sir.

Mr. BATES. Now, did you agree at that time with his findings?

Captain MEADE. Yes, sir.

Mr. BATES. You agreed with his findings?

Captain MEADE. Yes, sir.

Mr. BATES. His findings were to continue the exploration of this.

Captain MEADE. Yes, sir; I think there was an adequate justification at that time, sir.

Mr. BATES. Now, what has made you change your mind in this short time?

Captain MEADE. Because, sir, we have gotten to the point where the completion of a reasonable evaluation puts us into an area where the wells to be drilled are very expensive and beyond economic justification at this time.

Mr. BATES. Well, I would say, in the few days that we were there we gathered the same information a year and a half ago.

Now, one other question:

In Mr. Gavin's report, which he read from the Senate report, this exploration was to be consummated on December 31, 1952, which is now in the past.

What caused the delay? Why isn't this ready for proper evaluation at this time?

Captain MEADE. I believe, sir, that at that time the Secretary made a decision that unless the results were very favorable during that particular calendar year, up to December 31, 1950, as I recall it, that he would suspend the operations.

The Assistant Secretary made a personal trip to Alaska, and very carefully reviewed and analyzed the situation, and he felt that results were favorable. He came back and felt that it was not wise for him to shut down the program.

He held a consultation with the then chairman of your committee, as I recall it, and I was present. Mr. Vinson, of course, can speak for himself on that. But my understanding of the result of that conference was that the time had not yet come to stop, that there was further work to be done, and if that were so the Navy should do it.

Mr. BATES. Then, that is the report that he made that I referred to a few minutes ago?

Captain MEADE. Yes, sir; that is part of the same situation.

Mr. VINSON. Secretary Koehler.

Captain MEADE. Yes, sir.

Mr. BATES. The subcommittee that made the trip, read that report, and after it read the report we made the same conclusions at that time that we have just made today, that there was no real justification for the continuation of that project. All I could determine from reading this report is "We don't know quite where we are going; let's keep on until we find an answer."

One further question. One of the problems we found a year and a half ago up there was—and also this past September when we were up there when we talked to General Kepner on this particular project, and the matter that Mr. Gavin mentioned this morning, was concerning the future of this project in the event that it was continued.

We could seem to get no concrete information whatsoever as far as development plans were concerned. And I wonder if such plans are available so that for the future if we want to look over the record of this particular hearing we will have some idea what the future plans were, and could you have those incorporated in the record?

Captain MEADE. It has never been possible to make such plans, sir, because a reasonable evaluation of the prospects in the reserve have not been completed.

Mr. BATES. Well, that is true. But on the other hand, you are not going to drill a lot of wells without exploring the entire problem, the question of getting it out, the economic feasibility, the cost of these various things, going over the Brooks Range. You certainly inquired into that problem before you went ahead; didn't you?

Captain MEADE. There have been made preliminary studies as to a pipeline, sir. It is not possible to make a full economic study such as you have requested with the information that we have at hand at this time.

Mr. BATES. That is right; but you had estimates of cost of pipe line, etcetera.

Captain MEADE. We had opinions; yes, sir. We thought of these subjects, naturally.

Mr. BATES. Well, could you give us——

Captain MEADE. In general the opinion has been that it would require a field which would be possible to be produced approximately at the rate of 100,000 barrels per day in order to make it economically justifiable.

Mr. BATES. And then there would be certain costs attendant to that, the establishment of the pipeline, etcetera, and how you are going to use this and find the oil, and all that?

Captain MEADE. Yes, sir.

Mr. BATES. You have gone through all that thinking.

Captain MEADE. In a very rough way, based upon assumptions; yes, sir.

Mr. BATES. Is it in writing somewhere? Somebody must have made a study of that, even if it was cursory in nature.

Captain MEADE. I believe the opinions are on record in the minutes of our advisory committee of the past.

Mr. BATES. Then I wonder, Captain, if you could provide this committee with that supplementary information?

Captain MEADE. I do not have it here. I will put it in the record.

A search of the files of the office of the Director, Naval Petroleum Reserves, Denver, Colo., has yielded the following:

(1) A report, Economic Aspects of Developing Naval Petroleum Reserve No. 4, Alaska. This report, dated October 1, 1945, was submitted to the Director, Naval Petroleum Reserves by Lt. Robert J. Bradley, USNR, economist, Naval Petroleum Reserves, and it consists of 160 typed pages.

The report discusses in some detail:

Estimates of drilling costs in National Petroleum Reserve No. 4;

Estimates of pipeline road-construction costs in National Petroleum Reserve No. 4;

Estimates of pipeline construction costs in National Petroleum Reserve No. 4;

Estimates of tankship transportation costs between warm-water Alaskan ports and California refineries.

On page 88, these words appear:

"It would seem that Naval Petroleum Reserve No. 4 will not be economically important unless it is capable of producing something on the order of 100,000 barrels per day with wells that are reasonably good in order to offset the high cost of operations in that area."

(2) Correspondence from the Navy Department to the Naval Affairs Committees dated November 15, 1945, reports that a potential production of approximately 100,000 barrels per day from a reservoir of from 400 to 500 million barrels will be required to support the venture economically.

(3) A similar statement appears in testimony by Comdr. W. G. Greenman, USN, the then Director, Naval Petroleum Reserves in hearings before the Naval Affairs Committee of the House of Representatives on December 4, 1945.

(4) In November 1951 at an advisory committee meeting, Mr. Lewis MacNaughton, of DeGolyer & MacNaughton, expressed the opinion that discoveries of the magnitude of at least 6 or 7 times the Umiat field now discovered would be required to justify economically the construction of any pipeline to the south.

The CHAIRMAN. Mr. Norblad.

Mr. NORBLAD. I was also a member of the Hardy subcommittee that went to Alaska with Mr. Bates, and I want to say I subscribe to everything that Mr. Gavin has said, 101 percent.

That is all I have to say.

Mr. VINSON. Mr. Chairman.

The CHAIRMAN. Mr. Vinson.

Mr. VINSON. Mr. Secretary, since you announced that you are not going to ask for any appropriation to carry on the work up there, what is your program with the reserve? What are you going to do with it?

Secretary ANDERSON. Well, sir, I think as of the moment that we ought to just have an orderly withdrawal of what we have there. Frankly, I have not an inventory of that materiel before me, but I think we should just have an orderly withdrawal and not continue the exploration.

Mr. VINSON. Now, for the record, my recollection is this is reserve No. 4 set aside by an Executive order out of public domain. Isn't that correct, Captain?

Captain MEADE. That is correct, with respect to the reserve itself. In addition, the areas adjacent to the reserve, north of the Brooks range, have been withdrawn by the Secretary of the Interior from public entry for the purpose of our exploration.

Mr. VINSON. All right.

Anyhow, there is set aside a large area up there as a naval reserve, and we have spent some $50 million and we haven't yet found a sufficient amount of oil to justify further development; is that correct?

Captain MEADE. Yes, sir.

Mr. VINSON. Then, what do you propose to do with it now?

Of course, I gather from what was running through Mr. Gavin's mind, Mr. Gavin wants to open it up and try to justify it.

Mr. GAVIN. I haven't any thought—so I can correct you at that point. I just think there is no economic justification for continuation.

I have no thoughts about what should be done.

Mr. VINSON. Let's see; what are you going to do?

We have a great reserve up there that we spent $50 million on. Now we are going to stop. Now, what are you doing to do, just let it stay there, or are you going to make contracts with private enterprise to go in there and develop it and see what they think about it?

Secretary ANDERSON. No, sir; we will not plan to make private contracts.

Mr. VINSON. What did you say?

Secretary ANDERSON. We will not plan at this time to make private contracts.

The CHAIRMAN. I think the Chair would make one helpful suggestion here, a very brief statement:

This reserve was set up, created or set aside, during World War II, when we were desperately in need of oil.

Secretary ANDERSON. Yes, sir.

The CHAIRMAN. And we would go anywhere on the face of the globe and almost at any cost in order to get more oil, because it is the lifeblood in modern mechanized war. We needed it then. I think that is sufficient justification for initiation of the project. But having spent the money you have, and the length of time you have had to make these explorations, you now arrive at a sensible conclusion, I think, that there is no longer justification at the present status of world conditions to continue the further expenditures at this time. But by an orderly withdrawal, we are not going to determine once and forever that we will not perhaps resume explorations at some future time if the emergency is so great that we are driven to it.

Mr. VINSON. Is that the thought of the Secretary?

Secretary ANDERSON. Yes, sir.

The CHAIRMAN. That is the justification for it.

Mr. WICKERSHAM——

Mr. VINSON. Wait one minute, then.

After we balance the budget, then, we will probably have to go back in there.

The CHAIRMAN. Mr. Wickersham.

Mr. WICKERSHAM. Mr. Secretary, I noticed in the paper recently where someone had leased a tremendous amount of territory for exploration purposes to Phillips Petroleum Co., who farmed out some of it to Kerr-McGee.

Where is that area in respect to this area?

Captain MEADE. I believe I can answer that, sir. That is not Navy land. That is an area from the public lands in the southeast portion of Alaska.

Mr. NORBLAD. About 800 miles away from this.

Captain MEADE. Yes, sir. It is the Yakutat-Katalla area.

Mr. WICKERSHAM. Don't you believe if two companies are interested in spending $800 million 800 miles away, which isn't a great

distance, from this area, there might be a tremendous reserve at Point Barrow in that area?

Captain MEADE. The possibility remains for that to be so; yes, sir. We have not disproved the area at all.

Mr. VINSON. Mr. Chairman, may I ask this question:

Mr. Secretary, in view of your statement, which I think you are absolutely sound on, not to open it up, is there any intention of you to turn it back to the Interior Department or do you propose merely to just let it stand in status quo for the time being?

Secretary ANDERSON. I would just propose to let it stand in status quo, sir.

Mr. VINSON. Then if you reach the decision the proper thing to do is to make some change, you will come back and give the committee the benefit of your views; is that right?

Secretary ANDERSON. Yes, sir; I certainly will.

Mr. VINSON. That is all right.

Mr. GAVIN. Mr. Chairman, I just want to concur in what the Chairman has stated relative to why this exploration project proceeded. The Canol project was conceived because there was, during the war, a threat to the Aleutians and we could produce and refine the oil there to meet our demand to fight the war. But when the threat was removed, and there wasn't any need to go on, the Army did go on and completed the refinery and the pipeline and then suddenly abandoned it, and nature took over.

But that was the reason for the first attempt up there in the exploration for oil.

The CHAIRMAN. General Devereux.

Mr. DEVEREUX. Mr. Secretary, is the National Security Council in agreement with your recommendation?

Secretary ANDERSON. That I could not answer, sir.

Mr. DEVEREUX. It has never been discussed, the general oil policy of our country, with the National Security Council?

Secretary ANDERSON. I have not discussed the Point Barrow matter with the National Security Council, sir.

Mr. DEVEREUX. Do you, as Secretary of the Navy, believe or not, that that should be something that should be discussed with the National Security Council?

Secretary ANDERSON. I think it should be directed to their attention.

Mr. DEVEREUX. Sir?

Secretary ANDERSON. I think we should direct their attention to our proposal.

Mr. DEVEREUX. Thank you.

The CHAIRMAN. Mr. Price.

Mr. PRICE. Mr. Chairman. Mr. Secretary, in reaching a determination of this nature, about how many men would be involved in the Navy in making this determination—engineers that are in Captain Meade's department; people who are familiar with the project, and the work, the oilmen, the engineers?

Do you have a board that reaches this decision or just one or two men that say "We can just give up on that?"

Secretary ANDERSON. Well, I have consulted only Captain Meade and, oh, I should say 2 or 3 who are members of his staff.

Mr. PRICE. The point I am trying to get at: Is everybody in the Navy of the same opinion, or do you have some conflict within the Navy with what you should do at Point Barrow?

Secretary ANDERSON. I am not aware of any conflict, sir, although I certainly could not say.

Mr. PRICE. That is the point I wanted to get at. Is there any conflict or is everybody of the same opinion who has any knowledge of this project?

Secretary ANDERSON. Can you?

Captain MEADE. I can say, sir, that before advising with the Secretary on this matter, I consulted a number of people interested in this problem in the Defense Department, and I found no one in favor of continuing this project.

The CHAIRMAN. Mr. Wilson.

Mr. WILSON. I would like to ask Captain Meade if he considers the investment a complete loss today?

In other words, is there some continuing value for the explorations today?

Captain MEADE. I am very glad you asked that question, sir, because I would like to hope that the committee feels that the money has been well spent. Certainly $50 million is a lot of money. If you compare, however, commercial exploration of a similar area, I think you would find much larger sums spent. There has been a reasonable expenditure in an attempt to make an evaluation of this enormous area which is the size of the State of Colorado, for instance.

The CHAIRMAN. You have gathered much valuable data?

Captain MEADE. Yes, sir.

The CHAIRMAN. It is not a complete loss.

Captain MEADE. You have much scientific information and much information that I think may have military value, sir.

Mr. VINSON. Mr. Chairman, I want to say this: For one member of this committee, I want to take this opportunity to congratulate our new Secretary upon the profound impression he has made on my mind from the way he has presented these subject matters, and the frankness and candor with which he has addressed the committee.

Secretary ANDERSON. Thank you very much, Mr. Vinson. From you it is a great compliment.

Mr. VINSON. I am gratified a man of your candor and frankness is at the helm of the Navy.

Secretary ANDERSON. Thank you very much, sir.

The CHAIRMAN. And all the members of this committee will bear in mind that the Secretary has been in office only a month or two. This is not his baby.

Mr. VINSON. Not a bit.

The CHAIRMAN. The little critter was dumped into his lap. But in the brief time that he has been in the Department, he has revealed this morning an amazing grasp of these problems and he has stated it in a forthright and very frank manner. All of us are deeply appreciative, Mr. Secretary, and this committee agrees with the conclusions and decisions that you have reached, and you may feel free to go ahead and do the good job which I am sure you are going to do.

Secretary ANDERSON. Thank you very much, sir.

The CHAIRMAN. Now, before we adjourn or recess, Subcommittee No. 2, Mr. Arends' committee, meets at 10 o'clock Monday morning. On Wednesday we will call up the bill to extend the dependency benefits on the floor of the House.

I doubt whether we will meet Tuesday. We are going to stand in recess subject to call of the Chair.

(Whereupon, at 11:40 a. m., the committee recessed, subject to the call of the Chair.)

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